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FEDERAL SYSTEMS INTEGRATION MARKET, 1987-1992

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Federal Information Systems and Service Program (FISSP)

Federal Systems Integration Market, 1987-1992

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Abstract

INPUT estimates that the federal government market for systems integration and turnkey systems opportunities will increase from $2.3 billion in 1987 to $4.8 billion by 1992, an average annual growth rate of 16%.

This update of the 1986 integration report presents the results of research and analyses of various operational aspects and strategies of the integration market, including systems integration and turnkey systems. The many changes in this update include:

- An updated forecast of the custom integration and turnkey systems market, including current and out-year funding.
- A revised list of open opportunities and recent awards.
- An update of the competitive trends and market share of major turnkey systems vendors.
- An examination of issues impacting federal government custom systems integration and turnkey systems vendors.

This report contains 165 pages, including 47 exhibits.

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I

Introduction

As a result of improved services from GSA, ever greater productivity demands and dramatic improvements in the technology (such as more powerful microcomputers and relational data base management systems), many agencies are reassessing their information systems strategies. Agency five-year plans are beginning to reflect this reassessment in the form of greater systems integration (SI) requirements.

This growth in the federal SI marketplace, coupled with expanded opportunities in the commercial sector, implies significant changes for a wide variety of vendors – hardware manufacturers, software products suppliers, communications vendors, professional services firms, aerospace firms in the information services industry, and management consultants.

This revised report on systems integration and turnkey systems provided to the federal government was prepared as a part of the Federal Information Systems and Services Program (FISSP). This report was based on research and analyses of several sources, including:

- INPUT's Procurement Analysis Report (PAR).
- OMB Five-Year Information Technology Plans for 1987-1992.
- Discussions with INPUT's FISSP clients.
- Interviews with leading federal systems integration and turnkey systems vendors.
- Interviews with federal agency officials with active turnkey systems and systems integration programs.

A
Scope

This report covers those turnkey systems and systems integration programs listed in the OMB/GSA/NBS Five-Year Plans for government fiscal years (GFY) 1987-1992, related federal agency long-range automated data processing (ADP) plans, and federal agency GFY 1987 and 1988 Information Technology Budgets.

The period of interest is GFY 1987-1992. Although GFY 1987 will have been completed at the time of this report's publication, a number of 1987 program initiatives were delayed by implementation of the Gramm-Rudman-Hollings deficit reduction act and other funding restrictions. They therefore serve as a basis for this report.

The vendors selected for interviews in the current revised report were identified as contractor of record for ongoing integration programs or listed as vendors for turnkey systems or systems integration services in INPUT's Company Analysis and Monitoring Program database for 1987. Interviews for the previous update were obtained from leading systems integration and turnkey systems vendors in terms of 1985 revenue derived from systems contracts with the federal government. The agencies selected for interview were identified in one or more of the above plans as proposing to contract with turnkey systems or systems integration vendors.

B
Methodology

The OMB/GSA/NBS Five-Year Plan analysis for the INPUT Procurement Analysis Report was reviewed for programs to be initiated during the period of interest. INPUT researched the available agency long-range plans for GFY 1986-1991 and 1987-1992 for major system replacements, conversion from out-of-agency data processing services, and new system initiations (new starts). Releases from the OMB Federal Contract Reporting Center were also reviewed to identify contract sizes, duration, and modification trends, and to aid in assessing market shares.

INPUT developed questionnaires (see Appendix F) for interviews of both federal agency officials and integration and turnkey systems vendor executives (see Appendix A for respondent profiles). Federal agency officials selected for interview included:

- Information resource managers.
- Contracting officers (buyers).
- Program managers (users).
- Data Center Managers (users).

Vendor executives selected for interview included:

- Company executives.
- Marketing executives.
- Operations executives.

INPUT developed the questionnaires from client discussions and reviewed the questionnaires with clients to include areas of interest. The earlier questionnaires were revised to focus on changes in the systems integration and turnkey systems marketplace. The agency questionnaire was designed to acquire information about plans for replacement, new, systems and applications. The vendor questionnaire was formulated to acquire information about industry status and future federal market plans.

C

Report Organization

The report contains the following sections:

- Executive Overview.
- Market Analysis and Forecast.
- Agency Requirements.
- Systems Integration Vendors.
- Systems Integration Opportunities.

Several appendices are provided to aid in report use:

- Interview Profiles.
- Definitions.
- Glossary.
- Policies, Regulations, and Standards.
- Related INPUT Reports.
- Questionnaires.

II

Executive Overview

A

Federal Market Pressures

Prospects for the federal systems integration market during the remainder of the decade have risen considerably, with the government focus on upgrading its in-house information resources.

Heavy commitment of the federal workforce and vendor support for maintaining existing systems, particularly applications software, emphasizes the need to reduce the life cycle maintenance costs by introduction of more efficient software and more reliable hardware.

A continuing increase in the ratio of software-to-hardware costs lends emphasis to the utilization of efficient, commercially designed and developed ADP systems.

Concerned by the potential for late delivery and/or cost overruns, federal agencies have increased the vendor's share of implementation risks by changing the types of contracts used. Acquisition reforms introduced under FAR and FIRMR emphasize competition while reducing unscheduled sole-source activity.

EXHIBIT II-1

FEDERAL MARKET PRESSURES*

- Upgrade Information Resources
- Reduce Maintenance Expense
- Increase Use of Commercial Products
- Share Implementation Risks

*Updated 10/87.

B

Market Forecast

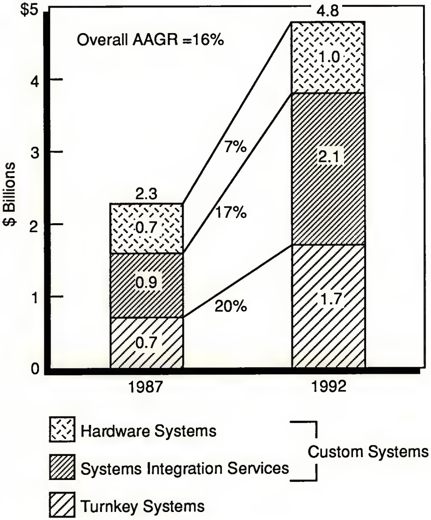
INPUT estimates that the federal government systems integration market will increase from $2.3 billion in FY 1987 to $4.8 billion by 1992, an average annual growth rate of 16% as shown in Exhibit II-2. The growth rate in the late 1980s will be slower, but will increase as large acquisitions that were delayed by the 1986 Gramm-Rudman-Hollings Act deficit reduction measures get underway.

Initiatives that require turnkey systems will show the strongest growth rate as agencies opt for packaged systems approaches, especially in the 1988-1990 period. Demand for custom developed systems integration will continue to meet unique federal needs. The hardware component associated with these SI programs will show only modest growth as falling hardware prices and the desire to integrate existing hardware into the new integrated configurations take effect.

The forecast excludes budgeting estimates for post-installation facilities management, maintenance beyond warranty periods in systems integration programs, and subsequent custom software development.

EXHIBIT II-2

FEDERAL SYSTEMS INTEGRATION MARKET FORECAST*



Note: Dollars rounded to nearest $100 million.

*Updated 10/87.

C

Application Targets – Turnkey Systems

Turnkey systems are value-added packaged hardware and software solutions to cross-industry applications requirements, that satisfy, with few modifications, commercial, industrial and government needs.

The scientific and engineering applications include the largest number of initiatives, for about one-third of the requested funding over GFY 1987 to

1992. These include CAD, CAE, CIM, and data collection packages, for which energy and defense have the greatest need during this period.

Document handling is the second largest application area, which may also be a portion of the custom systems required for DoD's CALS (Computer-Aided Acquisition and Logistics Systems) initiatives. These applications include library, graphics, mapping, and publishing systems, which are gaining renewed interest with agency plans to minimize paper files.

Personnel management/ human resources applications are focused in the civil agencies, since the defense agencies have unique requirements that can only be met by custom systems.

Other applications – principally for the civil agencies – being sought include (vehicle) fleet scheduling, maintenance tracking, medical/drug information, and financial systems.

EXHIBIT II-3

APPLICATION TARGETS OF SELECTED* TURNKEY SYSTEMS INITIATIVES

APPLICATION	INITIATIVES, 1987-1992	
	NUMBER (Percent)	FUNDING (Percent)
Scientific/Engineering	73	36
Document Handling	10	38
Personnel Management	5	15
Other	12	11
Total	100	100

*Updated 10/87.

D

Competitive Forces

Recent systems acquisition programs vary from separate contracts for systems design/engineering/integration, hardware systems, hardware peripherals, software conversion – to prime contracts like the MILPERCEN 80X and FORCECOM programs. Systems integration specialists in systems houses, aerospace firms, and the FCRC nonprofits appear as strong competitors to conventional mainframe manufacturers.

Early teaming discussions and long-term relationships with key suppliers are proposal evaluation factors for agency source selection boards. Commitment of preferred sources can be crucial in major acquisitions. Subcontractor specialists in software, fabrication, training, and special applications play increasingly important roles in establishing credibility with the acquiring agency.

Interest in the size of the systems acquisition budget of the federal government is growing among "non-traditional" companies with proven capabilities or essential capital and lines of credit. Both contribute to vendor prospects for management of risk and financial stability.

EXHIBIT II-4

COMPETITIVE FORCES*

- Prime Versus Integration Contractors
- Key Supplier Relations
- Subcontract Specialist Role
- Non-traditional Competition
- Risk Management

*Updated 10/87.

E
Selection Criteria

Interviewed agencies and vendors indicated differences of opinion in the significance of contractor selection criteria. The agencies' ranking was influenced by those with prior systems integration contract experience. Vendors ranked criteria by experience in proposal evaluations for SI awards.

EXHIBIT II-5

SELECTION CRITERIA SIGNIFICANCE: SYSTEMS INTEGRATION CONTRACTS

RANK	AGENCIES	VENDORS
1	Technical Solution	Technical Solution
2	Life Cycle Cost	Risk Containment
3	Contract Type	Life Cycle Cost
4	Risk Containment	Initial Cost
5	Initial Cost	Contract Type
6	Project Management	Project Management

Most agencies and experienced systems integration vendors prefer fixed-price contracts with a mix of CPFF for design/development and FP for implementation as a second choice. The agencies see the FP contract as a firm vendor commitment, while the vendor endorses fixed pricing as a way of minimizing trivial or unnecessary client changes.

More-stringent and effective program management practices appear essential to contract award and profitable completion by the vendor, also to earlier warning of impending delays and potential cost overruns to the client agency.

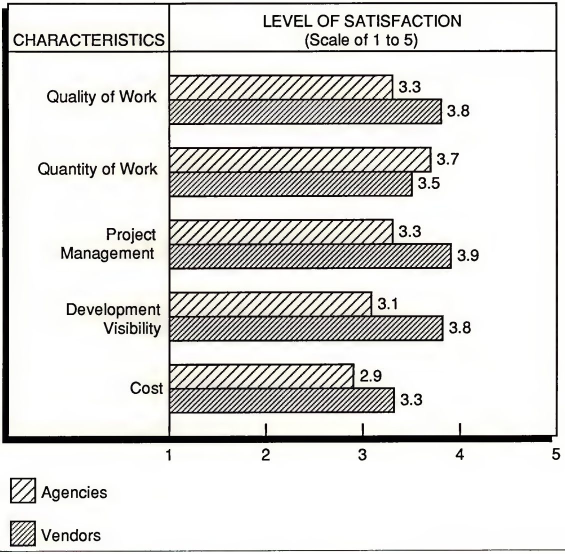
F

Agency Satisfaction

Agencies are far less satisfied with the quality of work, vendor project management, and visibility of system development than vendor management perceives or is led to believe by their project leaders. As shown in Exhibit II-6, agencies believe they lack enough qualified system planners and program managers for exercise of tighter control over system integration projects. Agency executives prefer greater vendor risk sharing and that responsibility for on-time completion be placed on the contractors. Recent fixed-price awards as well as multiple-type contract awards are attempts to move risk to the vendor.

EXHIBIT II-6

AGENCY SATISFACTION WITH SYSTEMS INTEGRATION VENDORS



Vendors believe that they provide higher levels of program management and visibility because of the nearly continuous audits and surveys of DCAA, non-government system managers, and agency maintenance/control document specialists. Vendors also believe that costs are understood by the contract specialists and project technical representatives, but are often misstated by higher-level agency officials. Vendors have begun to protest awards that are priced low to win and renegotiated soon afterward.

G

Defense versus Civil Agency Markets

The number of turnkey and custom opportunities identified in exhibit II-7 does not reflect the entire market, but is representative of relative interests of defense versus civil agencies.

The statistics indicate a new shift wherein the civil agencies have more than doubled their stated custom systems integration intentions since the 1986 version of OMB A-11 Section 43B Budget Request. Conversely, the number of turnkey systems has declined, but at a higher average value per system. A number of civil agency system replacement programs now planned for in-house integration may go to contract if staffing budgets remain at their current levels.

Some agencies identify planned turnkey systems buys on a site or function basis; others lump numerous buys within one program. Energy, for example, identified 23 individual initiatives totaling $70 million, whereas

EXHIBIT II-7

DEFENSE VERSUS CIVIL AGENCY MARKETS*

	TURNKEY SYSTEMS		CUSTOM SYSTEMS	
AGENCY	NUMBER	BUDGET ($ Millions)	NUMBER	BUDGET ($ Millions)
Defense	7	145.3	24	1,017.4
Civil	33	218.3	59	2,323.7
Total	40	363.6	83	3,341.1

*Updated 10/87.

Treasury's initiatives totaled $113 million for two programs. Also, many turnkey systems fall under the A-11 reporting threshold of $1 million life cycle cost and are not therefore specifically identified in agency documents.

H
Recommendations

Hardware and software systems houses need to improve prebid and proposal strategic planning to increase the prospect of award.

Systems integration vendors need to invest more effort in understanding the agency's mission and its information resource requirements in order to find an appropriate system solution, rather than modify the requirements to meet an available solution. Agency policy officials voiced this concern repeatedly.

Professional services vendors with experience in the federal government sector should initiate marketing strategies to penetrate both the systems integration vendor and federal agency segments to improve awareness of special skills and capabilities.

Software product vendors need to substantially improve their awareness of federal software requirements and increase the visibility of their products.

Turnkey systems vendors should find the means to increase the margins between hardware costs and "value added." One viable approach is for those vendors to become cust[illegible]lers/manufacturers.

EXHIBIT II-8

RECOMMENDATIONS

- Improve Bidding Strategy
- Understand Mission and Needs
- Penetrate Agency and Bidders
- Increase Visibility of Products
- Improve Value-Added Margins

III

Market Analysis and Forecast

A

Overview

During the two most recent past administrations, presidential task forces investigated the problems and technological status of the federal government's information processing resources. Among the findings were:

- The government had not taken full advantage of the technological advances of the private sector.
- A substantial amount of the ADP inventory was obsolete or rapidly becoming obsolete.
- Federal executives have not managed ADP resources effectively.
- Major initiatives were urgently needed to bring federal information management to the level needed for regulation, taxes, security, and services to the public.

These findings, along with some fundamental changes in GSA's information systems (IS) management policies, have led to gradual changes in IS procurements. These changes, coupled with agency desires for integrated solutions, have fueled the growth of federal systems integration opportunities. INPUT believes that the demand for integrated systems in the federal government will be sustained at least through 1992 before leveling off, unless impacted earlier by one or more critical national economic issues. Furthermore, the delay in replacement timetables enhances the prospect of increased vendor-furnished systems integration.

Future-year funding of current acquisition programs and approval of funding for the next budget year are always in doubt in the federal government market. The authorization of an agency budget and the requested information resources by the agency oversight committee do not assure the agency or vendors that funds will be provided. Appropriation Acts for the agencies approve the TOA (Total Obligational Authority) for certain large systems, but not the fiscal year or years in which the funds will be expended (called outlays).

Continuing economic and political sensitivity to the large national budget deficit could negatively impact a number of SI acquisitions in the "less than critical" defense and civil technology sectors. Presidential election years (1988) often imply budgeting for political, not practical, reasons, thereby leading to budget cuts in FY 88. Major ADP systems already approved are likely to continue in preference to unapproved programs.

Major civil systems affect service to the public and have greater political appeal than research programs. Deficit control measures, especially those under the Gramm-Rudman-Hollings (GRH) Act, could force agencies to cancel programs that do not meet stringent productivity improvement requirements and, in some cases, delay or stretch those that do. However, at this writing the Congress appears to be backing away somewhat from the GRH targets.

Systems acquisitions in the second half of the 1980s are addressing needed improvements in management, administration, human resources, and logistics functions that have not received newer data processing resources in more than a decade. Congress urgently needs more precise and timely data for the legislative process. Administration decisions require complete data on domestic issues and regulatory affairs in order to satisfy congressional mandates.

Agency executives need trend analyses and status reports that accurately portray funding, staffing, and performance progress against mission objectives. Required are accurate, up-to-date information management systems. The public too is pressing for solutions to delays and errors in processing payments and to delays in satisfying information requests.

Key government agencies – OMB, GSA, GAO, and NBS – have initiated a progression of acquisition reforms intended to accelerate the acquisition and improve the management of information resources (ADP and telecommunications) while fostering wider competition. Also, the agency reforms serve to promote standardization and compatibility of systems.

B
Market Forecast

The federal systems integration market includes both turnkey and custom systems, as indicated earlier in Exhibit II-2. The market also involves a portion of standard OBM A-11 Section 43 budget items, identified as hardware, professional services, software products, and other services. The forecasts include:

- Mode forecast:

  -Hardware.
  -Professional services.
  -Software products.
  -Other.

- Agency forecasts:

  -Turnkey systems.
  -Systems integration.

- Applications forecast:

  -Systems integration.
  -Turnkey systems.

1. Mode Forecast

The service mode components of the integration forecast are illustrated in Exhibit III-1, including forecasts for hardware, professional services, software products, and other services. The estimates were developed and updated from a variety of sources, including agency interviews, budget requests, program descriptions, and long-range information resource plans that are subject to administration and congressional budget approval cycles.

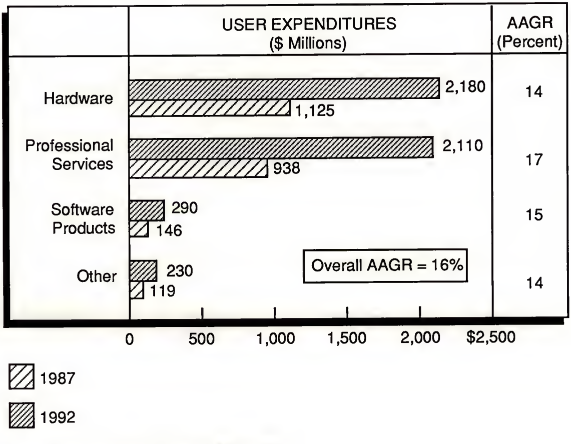
The forecast includes a strong period of growth after FY 1989 resulting from:

- Startup of programs delayed by Gramm-Rudman outlay cuts in 1986 and budget cuts for 1987 and 1988.

- Increasing amounts of outyear expenditures for programs started earlier but stretched by deficit control demands.

EXHIBIT III-1

FEDERAL SYSTEMS INTEGRATION MARKET FORECAST*



Note: Dollars Rounded to Nearest $100 Million.

*Updated 10/87.

- New programs scheduled to start in 1988-1989, with major outlays in 1990 and later.

The forecast also reflects the added costs of upgrades or replacements that have become major thrusts of agencies in the late 1980s period.

Although the total systems integration market is forecast at a 16% average annual growth rate (AAGR), individual market modes show varying rates.

- Professional services support for systems integration will show strong growth (17% AAGR) as agencies turn to vendors to provide the direction, design, development, implementation, and management for key programs—supplementing the in-house staffs reduced by budget reduction measures.

- Packaged system and applications software, including software required to provide connectivity in a multivendor environment, will be important ingredients in systems integration efforts, as indicated by the projected 15% AAGR.

- The hardware systems required at the core of systems integration efforts will grow at a modest rate. Falling hardware prices and agency plans to integrate current hardware within new solutions are the principal reasons for the anticipated slower average annual growth rate of 14%.

- The other service mode includes outlays for site preparation, installation, test equipment and tools, documentation, test and acceptance, which are expected to increase at an AAGR of 14%.

2. Agency Forecast

The agency integration activity forecasts are based on a combination of long-range ADP plans, projection of previous Information Technology Budgets, programs described in the agency OMB A-11 Section 43 A & B budget requests, and interviews with policy officials and ADP center managers. Only those programs specifically identified by agencies in their planning documents and funding request submissions are included. Generally, this includes those programs with a life cycle cost greater than $1 million. The number of identified integration programs is shown in Exhibit III-2 for turnkey systems and Exhibit III-3 for custom systems integration programs (individual programs are identified in Section VI).

No estimate is available for the cost or funding of planned conversion of applications from other information processing resources to new in-house systems. The current resources include RCS, PFM, and government data centers outside the agency. Values of monthly costs for running the application are not provided.

Agency shares of SI programs represent a combination of part of their ADP systems upgrade and replacement budgets and most of their new system acquisition budgets. Just as in last year's report, the exceptions

EXHIBIT III-2

TURNKEY SYSTEM INITIATIVES BY AGENCY, 1987-1992

AGENCY	INITIATIVES, COUNT		FUNDING REQUESTED	
	Number	Percent	$ Millions	Percent
Air Force	1	2.5	27.0	7.4
Army	1	3.0	50.3	13.8
Navy	3	7.5	52.1	14.3
USMC	1	2.5	2.7	<1
DLA	1	2.5	13.2	3.6
Subtotal Defense	7	18.0	145.3	40.0
Agriculture	1	2.5	1.2	<1
Commerce	2	5.0	10.2	2.8
Energy	23	57.0	70.6	19.4
Interior	2	5.0	16.3	4.5
Transportation	1	2.5	<.1	<1
Treasury	2	5.0	113.3	31.2
NASA	2	5.0	6.7	1.8
Subtotal	33	82.0	218.32	60.0
Grand Total	40	100.	363.62	100

Updated 10/87.

Note: Numbers may not exactly total due to rounding.

EXHIBIT III-3

CUSTOM SYSTEMS INTEGRATION INITIATIVES BY AGENCY, 1987-1992

AGENCY	NUMBER	FUNDING ($ Millions)
Defense		
Air Force	8	171.9
Army	7	523.5
Navy	4	107.5
OSD	5	214.5
Subtotal	24	1,017.4
Civil		
Commerce	1	143.1
HHS	5	26.0
Interior	10	99.9
Transportation	8	41.7
Treasury	15	1,614.3
NASA	6	322.4
Energy	14	76.3
Subtotal	59	2,323.7
Total	83	3,341.1

Updated 10/87.

remain the FAA portion of Transportation for the ATC Replacement, and new Air Force and NASA systems to support the military and civilian space initiatives. Most acquisitions reflect expansions of current programs. However, many agency executives also anticipate some upgrades and replacements.

The proportion of agency programs designated as upgrades, replacements, and new systems is discussed in Section IV.

3. Applications Forecast

Defense and civil agencies identify information resource applications by a wide variety of titles. Each of the military departments and defense agencies provide different codes and/or acronyms for such common commercial applications as personnel, payroll, distribution, and accounting.

Applications have been converted to standard terms defined in Appendix B, with variations on applications for particular functions grouped with the basic application. The approximate distribution of "primary" and "secondary" applications for systems integration initiatives as identified by the agencies is shown in Exhibit III-4. More specific information on the opportunities is provided in Section VI.

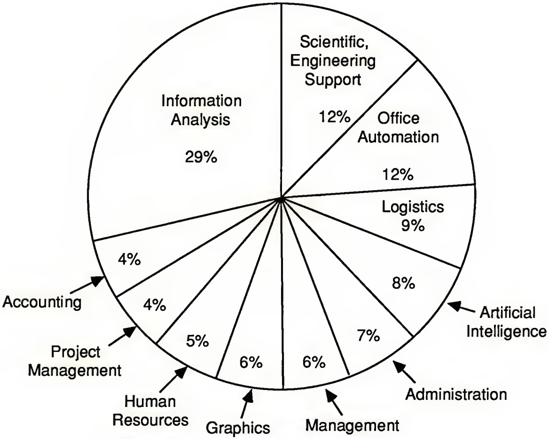
The applications forecast is not intended to be an accurate prediction, but merely representative of what vendors can expect in the federal SI marketplace. A number of SI programs note that additional applications will be added later in the program by either contract or in-house staff without specifying the application. In SI replacement programs, not all of the resident applications that will be converted to the new machine are specified. The implied trend of the identified operating systems and applications is discussed in greater detail in Section IV, Agency Requirements.

Exhibit III-4 shows that for the first time since INPUT began SI surveys, artificial intelligence achieved a measurable and significant (8%) rating from the survey sample.

However, those applications planned for conversion from non-agency processing centers—RCS, COCO (FM), government data centers, etc.—were not adequately defined by type and number in the representative interviews. Also notable was the tendency that timesharing systems will continue to take a smaller portion of most applications.

EXHIBIT III-4

FEDERAL SYSTEMS INTEGRATION MARKET BY TYPE OF APPLICATION, 1987-1992*



Primary and secondary applications categorized.

Note: Figures do not add up to 100% due to rounding.

*Updated 10/87.

Turnkey systems buys will be applied to a variety of applications, as indicated in Exhibit III-5. Scientific/engineering applications dominate the number of different initiatives identified, but not the total funding proposed through the forecast period. Rather, data collection, graphics, and personnel systems account for some 55% of the funding.

The heavy weighting on scientific/engineering applications (73% of the programs identified) is in part the result of a significant number of individual turnkey system buys planned by the Department of Energy for use in computer-integrated manufacturing (CIM). Apparently, agency interest in packaged hardware/software solutions is still very high across a wide spectrum of applications.

EXHIBIT III-5

TURNKEY SYSTEM INITIATIVES BY APPLICATION, 1987-1992

TYPE	FREQUENCY		FUNDING	
	Number	Percent	$ Millions	Percent
CAD	2	5	23.1	6
CAE	5	12.5	25.2	7
CAD/CAE (Multiple Applications)	6	15	44.9	12
CIM	16	40	40.1	11
Data Collection	3	7.5	112.6	31
Graphics	3	7.5	33.2	9
Library	1	2.5	1.2	<1
Personnel	2	5	53.0	15
Publishing	1	2.5	3.3	1
Records Management	1	2.5	27.0	7
Total	40	100	363.6	100

Updated 10/87.

C

Competition

Competitors for systems integration projects vary to some degree with the projected value, application, sponsoring agency, and end user. Additional discussion on SI vendors and market share is provided in Section V.

Potential and identified competitors for each category of systems acquisition are identified by service category. Some vendors compete in several categories because they offer products and/or services over a number of commercial and government market sectors, including:

- Specialized integrated systems.
- Mini/microcomputer-based systems.
- Midi/mini/microcomputer networked distributed data systems.
- Large CPU-based systems with or without distribution networks.
- Supercomputer systems that are frequently the host for several mainframes that may support distributed minicomputer and microcomputer terminals.

1. Specialized Turnkey Systems

The identified vendors are listed alphabetically in Exhibit III-6. The list includes parent firms of specialized divisions. A number of these companies appear in INPUT's most recent industry report. Others are specialists in defense systems.

EXHIBIT III-6

SPECIALIZED TURNKEY SYSTEMS VENDORS*

- American Microcad
- Auto-Trol
- Autographix
- Avant-Garde
- Bunker Ramo
- C^3 Inc.
- Charles River Data
- Computer Consoles
- Computervision
- Control Data
- Federal Data
- Harris
- Honeywell
- HRB-Singer
- IBM
- Intergraph
- M/A COM Sigma Data
- Megatek Corp.
- Prime
- Sanders Associates
- Sperry
- Tektronix
- Tera
- Texas Instruments
- TRIAD
- TRW

*Updated 9/87.

2. Professional Service Vendors

The larger professional service vendors are key competitors as both prime contractors and systems engineer/integrators in the SI market. Exhibit III-7 includes some of those identified in Exhibit V-1 of this report.

Smaller professional service vendors that are either seeking a role in SI or are involved through separate contracts with the contracting agency include:

- Big Eight accounting firms, especially for financial, budget, and accounting applications:

EXHIBIT III-7

MAJOR PROFESSIONAL SERVICES VENDORS IN FEDERAL SYSTEMS INTEGRATION

- Advanced Technology
- Apharel
- AT&T
- Boeing
- BDM, International
- CSC
- EDS/GM
- EG&G
- Ford Aerospace
- GTE
- Harris
- IMS
- Lockheed
- Martin Marietta
- Melpar
- Mitre
- NDC
- National Computer
- Northern Telecom
- Ocean Data
- PRC
- RCA
- SAIC
- Syscon
- TRW

*Updated 9/87.

  - Arthur Anderson.
  - Coopers and Lybrand.
  - Deloitte, Haskins and Sells.
  - Ernst and Whinney.
  - Peat, Marwick, Mitchell and Mann.
  - Arthur Young.

- Management services firms are also involved:

  - American Management Systems.
  - Bolt, Beranek and Newman.
  - Booz-Allen and Hamilton.

3. Mainframe Vendors

The major minicomputer, medium-, and large-CPU vendors are also contenders for SI programs because most offer upward-compatible CPUs for systems being replaced and newer systems with enhanced capabilities. These vendors include:

- CDC.
- Cray.
- Data General.
- DEC.
- Four Phase.
- Gould (SEL).
- Harris.
- Hewlett-Packard.
- Honeywell.
- IBM.
- NCR.
- Prime.
- Rolm (IBM).
- Tandem.
- UNISYS.
- VION.

4. Foreign Competition

Improving trade relations with the Far East and the NATO countries introduces the prospect of hardware system competition for non-sensitive administrative, management, and office automation projects. The popularity of the "Made in America" campaign coupled with the government's desire to reduce the trade imbalance may again place restrictions on the amount or type of business foreign competitors secure. Typical vendors include Hitachi, Fujitsu, ICL, Siemens, and Philips. At this writing, Toshiba has been informally banned from further federal business.

D

Integration Opportunities

Section VI contains a list of major SI and TS opportunities. Programs awarded earlier have been listed because they have multiple phases with contracts yet to be awarded. Every SI contract has some prospect of being recompeted. Some smaller SI programs have been defaulted and may be recompeted.

The programs listed for FY 1987 include a number in the solicitation and proposal stages for which awards have not been made. Some programs listed for FY 1988 already have feasibility, preliminary design, and requirements underway, but the prime contract or SE&I contract has not been awarded. The program lists for GFY 1989-1992 are smaller because a number of candidate programs for those years have not been approved by the sponsoring agency.

E

Federal Policy and Regulations

The systems integration market is subject to a wide range of federal policies and regulations. Federal ADP and telecommunications systems were procured and managed for more than two decades by the FPRs, FPMRs and ASPRs. ADPE and services procedures were modified by the 1966 Brooks Bill and its subsequent amendments.

The Office of Federal Procurement Policy was created in 1976 to develop a single procurement code for the federal government. It created OMB Circular A-109 for major systems acquisition, including ADP systems, which is still in effect but only for larger ($100-500 million) contracts or acquisition of "controversial" systems. The current procurement code, the Federal Acquisition Regulations (FAR), became effective April, 1984. Changes in the FAR are recommended by two agency representative groups: the Defense Acquisition Regulatory Council (includes NASA) and Civilian Agency Acquisition Council (all departments).

The Paperwork Reduction Act of 1980 includes a number of provisions concerning information resource management. The act:

- Created the post of Information Resources Manager in each department and major agency.
- Placed all but sensitive and mission-essential ADP under a new "mini-Brooks Bill."
- Provided a separate approval procedure for national security and defense mission ADP.
- Authorized annual preparation and publication of a Federal Agency Five-Year Plan for major ADP/Telecomm Acquisition by OMB and GSA.

Under the authority of the Federal Administration Act and the Paperwork Reduction Act, GSA prepared and made effective in April 1984 a new

regulation for information resources. The Federal Information Resource Management Regulation (FIRMR) superceded the FPR and FPMR in information technology areas. It combined in one regulation the acquisition, management, and use of all ADP and telecommunications not covered by separate statutes for reasons of sensitivity. It was initially based on the related sections of the FPMR and the FAR, as well as related provisions of DARC and CAAC-originated FAR amendments.

GSA intended that the FIRMR would streamline the information resources acquisition process. As pointed out in Section I, GSA is now rewriting the FIRMRs to reflect significant legal and regulatory changes.

Other regulations that changed the acquisition procedures include:

- The Competition in Contracting Act (CICA) of 1985 provides expanded legal powers for ADP protest action via the GSA Board of Contract Appeals (GSBCA) and GAO, increases the opportunity to employ negotiated contracts, and establishes seven more restrictive categories of exceptions that permit sole-source awards.

- The Paperwork Reduction Reauthorization Act of 1986 expanded the powers of the GSBCA, but also retained the Warner Amendment, which provides DoD with mission- critical ADP procurement exemptions to Brooks Act coverage:

  - GAO submitted an opinion in mid 1987 to the Congress that the Warner Amendment has not resulted in any improvements in the DoD procurement cycle.

  - GSBCA has offered opinions that further restrict the Warner Amend ment exemptions to field-deployable mission-critical computer re sources (MCCR).

- The Small Business Equal Competition Act (SBECA) of 1984 requires publication in the CBD of an agency's intent to award sole-source contracts, or GSA's intent to modify FIRMR or FAR in a manner that would require an increase in paperwork or eliminate competition from small businesses.

- OMB A-76 (Policies for Acquiring Commercial Industrial Products and Services Needed by the Government), which recommends government reliance on private sector goods and services, was revised in 1985:

- The policy became the administration's Productivity Improvement Plan (PIP), putting even more emphasis on cost-effective performance of ADP and other services.

- The policy required a comparison of the cost of in-house staff to contractor performance whenever an agency plans a major upgrade, replacement, or new ADP resources. This comparison is an attempt to determine if in-house performance is, in fact, cheaper than commercial acquisitions.

Systems integration acquisitions are conducted under either the FIRMR or FAR as appropriate to the function of the system. FIRMR applies to all ADP and telecommunications systems and services subject to the Brooks Bill—that is, general purpose systems of all agencies. FAR (with DAR modifications) applies to those ADP and telecommunications identifiable as intelligence or mission-critical information resources under the Warner Amendment to the Paperwork Reduction Act.

Changes in competitive practices, sole-source awards, and protest procedures of the Competition in Contracting Act (CICA; 1984) have been included via a Temporary Regulation effective May 1985. A rule change to allow agencies to select the system validation procedure suitable to the degree of risk to the government was released effective early 1986.

Agency source selection activities and acquisition policy officers have observed growing failure of the vendor community to become familiar with the bidding and evaluation conditions imposed by FIRMR and FAR. On the other hand, many contracting officers also have shown an inability to keep up with the regulations.

F

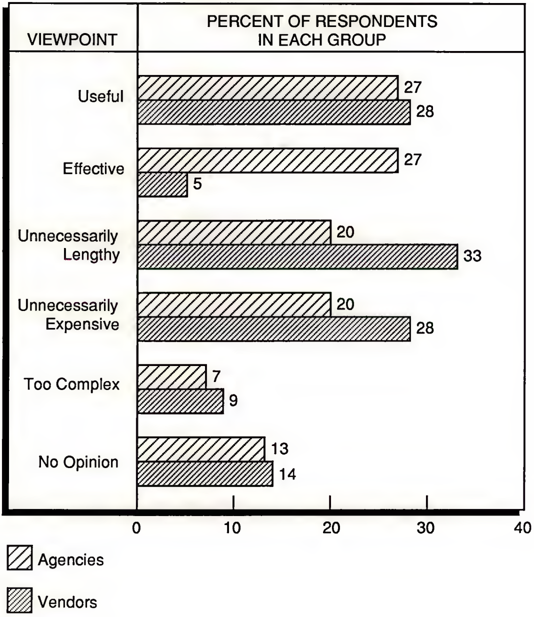
Uncertainties and Issues

OMB Circular A-109 and its Defense Department counterpart DD-5000.1 are expected to continue in force for major ADP/telecommunications systems acquisitions for all agencies. The principal effect of the new FIRMR has been an increase of the effective thresholds for application to each agency. Exhibit III-8 displays the reactions of agencies and vendors to the policy. Most IRMs believed A-109 would be imposed on all systems large enough to attract congressional attention.

The FY 1984 Defense Appropriations Act mandated the exercise of purchase options or competitive replacement of most leased DoD ADP equipment. Although the DoD "Buy-Not-Lease" mandate was not fully funded over the period of GFY 1984-1986, it could have far-reaching

EXHIBIT III-8

OMB-A109/DD-5000.1/5000.2 ACQUISITION POLICY—AGENCY VERSUS VENDOR VIEWPOINTS



Updated 9/87.

implications in DoD, where more than $2.1 billion ADPE was leased and scheduled to be replaced over a five-year period.

The mandate dictated competitive acquisition of replacement systems where the purchase option would acquire obsolete equipment. As a result, professional services vendors saw an opportunity to bid compatible system designs and system integration contracts. Because of the additional funding needed for purchase of equipment but not initially provided, the result was a slowdown in the upgrading process to new, more modern equipment and an increase in the amount of maintenance required to keep obsolete equipment (and the software designed to run on that equipment) operational until replaced. Competitive replacement of leased systems could also offer opportunities for code conversion, new software development, and training.

Four federal agencies (the Department of Agriculture, the Department of Health and Human Services, the Department of the Navy, and the National Aeronautics and Space Administration) have agreed to participate in the General Services Administration "Go for 12" Program. The program is designed to streamline the lengthy process required for the acquisition of automatic data processing and telecommunications resources to a point where major systems acquisitions are accomplished within a 12-month period.

Each agency will work with GSA in one of three pilot projects designed to model and test different aspects of the acquisition process. The three aspects of the program are the elimination of unnecessary bottlenecks in the acquisition process, the potential for parallel review of acquisitions, and the provision for special training in ADP and telecommunications acquisitions. The results and recommendations will be used to develop new procedures to be used throughout the government.

GSA is currently instituting a "Trail Boss" program, which would provide greater latitude to specific agency officials. However, some agencies oppose this because of its focus on the individual rather than the agency. Results from this program will also be dispersed government-wide.

Legal proceedings also add to the uncertainties of the federal market. The current Inslaw Inc. bankruptcy proceeding, involving nonpayment of software licensing fees by the Justice Department, represents a major concern to software product vendors who support systems integration programs as well as individual package sales. The Justice Department noted its intention to appeal to the District Count of DC the court order to pay $15 million in fees.

IV

Agency Requirements

A

Agency Share

INPUT discovered a wide variation of SI requirements among agencies. Exhibits IV-1 and IV-2 compare the distribution of integration initiatives identified by agency and type of effort.

New starts represent 20% of the programs in FY 1987 to FY 1992. Turnkey systems (TS) new starts have declined since the previous study, and are only notable in Energy (5) and Navy (2). New systems integration (SI) programs are most evident in Army (3), OSD (2), and Transportation (4).

TS replacements are dominated by Energy with eight programs. SI replacement programs are most notable in the program plans of the Air Force (5), Treasury (11), and Energy (7). Upgrades of turnkey systems are most frequent in Energy (10), while SI upgrades in NASA (6) represent the largest number of integration upgrades.

EXHIBIT IV-1

TURNKEY SYSTEMS OPPORTUNITIES BY AGENCY AND TYPE OF EFFORT, 1987-1992

AGENCY	UPGRADE/ EXPANSIONS	REPLACE-MENT	NEW START	TOTAL
Defense				
Air Force	1	0	0	1
Army	0	1	0	1
Navy	1	0	2	3
USMC	0	1	0	1
DLA	0	1	0	1
Subtotal	2	3	2	7
Civil				
Agriculture	1	0	0	1
Commerce	2	0	0	2
Energy	10	8	5	23
Interior	2	0	0	2
Transportation	1	0	0	1
Treasury	2	0	0	2
NASA	2	0	0	2
Subtotal	20	8	5	33
Total	22	11	7	40

Updated 10/87.

EXHIBIT IV-2

SYSTEMS INTEGRATION OPPORTUNITIES BY AGENCY AND TYPE OF EFFORT, 1987-1992

AGENCY	UPGRADE/ EXPANSIONS	REPLACE-MENT	NEW START	TOTAL
Defense				
Air Force	3	5	0	8
Army	4	0	3	7
Navy	1	1	2	4
OSD	2	1	2	5
Subtotal	10	7	7	24
Civil				
Commerce	0	0	1	1
HHS	1	4	0	5
Interior	3	5	2	10
Transportation	2	2	4	8
Treasury	2	11	2	15
NASA	6	0	0	6
Energy	5	7	2	14
Subtotal	19	29	11	59
Total	29	36	18	83

Updated 10/87.

B

Hardware Systems

ADP hardware requirements are only partially defined in the systems integration programs. Under A-109 guidelines, the hardware systems are not functionally described until the selection of the final contractor. However, few agencies are even considering the conduct of A-109-type procurements. New system acquisitions below the A-109 thresholds do not specify particular brands, pending completion of system architecture design. Furthermore, in a number of defense administrative, accounting, and human resource applications, one vendor may supply, under a requirements-type contract, computers to several systems with bulk purchase discounts.

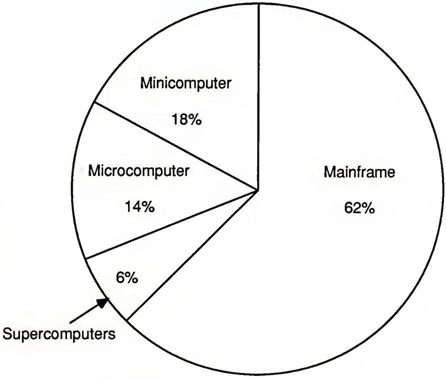
The distribution of type of target hardware, as presented in the Exhibit IV-3, indicates a continuing need for mainframe computers, although smaller systems (mini and micro) represent a third of the targeted hardware. The number of microprocessors, consisting of PCs and specialized workstations, accounts for only the planned major systems. The number of microprocessors to be acquired for a variety of smaller applications may be considerably higher, as much as an order of magnitude.

The already large government inventory of minicomputers is expected to at least double over the next five years. Some will serve clusters of microprocessors as network nodal processors or concentrators. Others will be employed as communications controllers and large memory interfaces. Still others will be applied to specialized scientific applications.

The government's medium to large computers are planned as DBMS and RDBS hosts and intermediary processors for the supercomputers. These computers will then serve as important elements in the agencys' planned major systems.

EXHIBIT IV-3

DISTRIBUTION OF TYPE OF TARGET HARDWARE SYSTEMS FOR SYSTEMS INTEGRATION PROGRAMS*



*Updated 10/87.

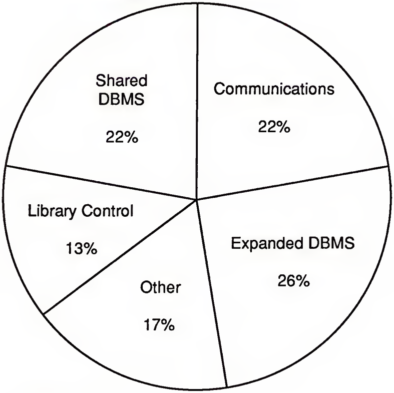
C
System Applications

The reference documents and the interviews for systems integration programs consulted in the current and previous report identified a wide variety of applications. Since this information indicates the current opportunities, they are included here as well. For convenience of discussion, the information has been divided into three categories: operating systems, primary applications, and secondary applications.

New operating system software requirements, other than those provided with a basic hardware system, are depicted as a percentage of the total requirements in Exhibit IV-4 and by previous year in Exhibit IV-5. The definitions are noted in Appendix B of the report.

EXHIBIT IV-4

OPERATING SYSTEM SOFTWARE REQUIREMENTS, 1987-1992*



*Updated 10/87.

The number of systems identified are to be considered representative of the requirements of systems within the FY 1987 to FY 1992 period. Communications management packages, which increase with the growth of distributed data processing networks around midsized CPU hosts, peaked in 1985. Shared data base applications and expanded DBMS reflect the agency plans to support networked systems, as well as greater vertical and horizontal integration of information, and have remained relatively stable since 1986. Library control software needs may be the initial step to both retaining applications in the host machine and downloading programs when required (similar to current RCS vendor offerings) and thus library control software needs have now declined.

EXHIBIT IV-5

TRENDS IN PRIMARY OPERATING SOFTWARE REQUIREMENTS 1982-1986

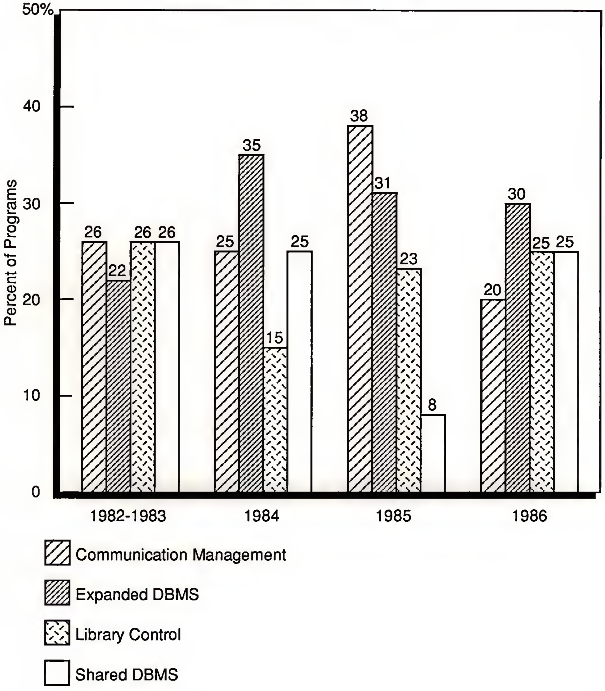
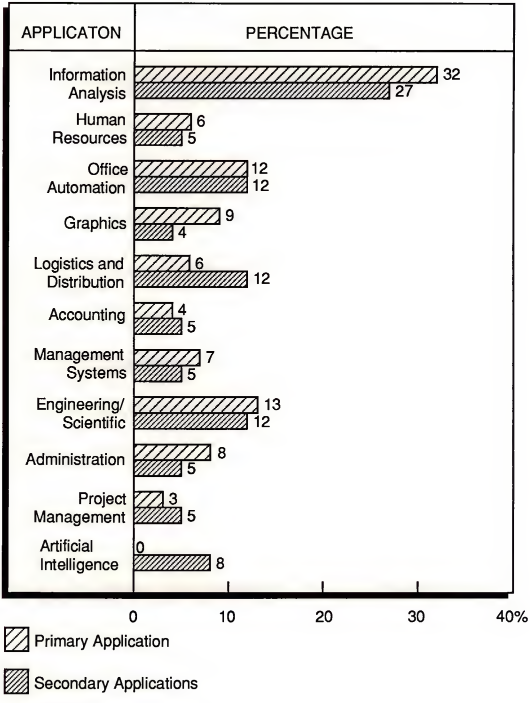


EXHIBIT IV-6

PLANNED PRIMARY AND SECONDARY APPLICATIONS OF SYSTEMS INTEGRATION PROGRAMS*



*Updated 9/87.

Exhibit IV-6 illustrates primary and secondary applications examples for the period FY 1987-1992. Again, the number identified should be considered representative of systems integration requirements only. Information analysis, human resource, and office automation applications illustrate the shift to better automation of data collection and analysis by the agencies. The secondary applications of administrative and management systems also support this trend.

Graphics applications on larger systems, in addition to the standalone integrated graphics systems, continue to increase in a number of agencies for both data displays and mapping.

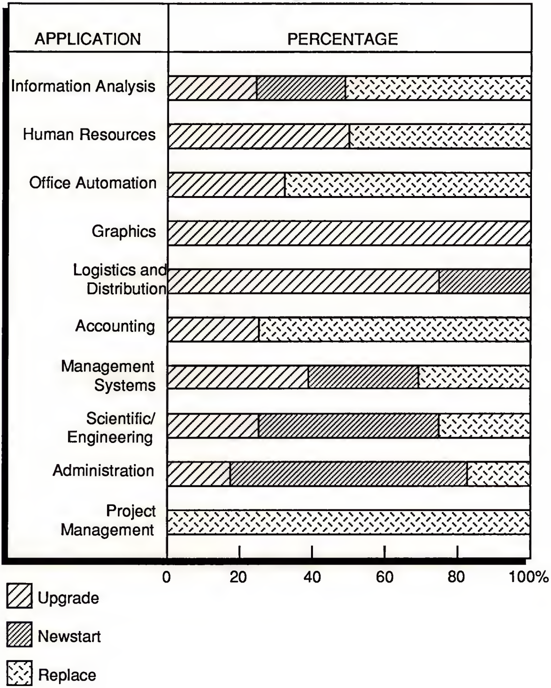
The defense-oriented applications have shown growth in the area of secondary applications. Logistics and distribution, as well as accounting applications, represent part of the system upgrade initiatives of the defense agencies. Secondary applications in the area of artificial intelligence are increasing, as agencies cited the need to add expert system capabilities.

The relationship between the application and the type of program is depicted in Exhibit IV-7. Major upgrades of current systems are planned for human resources, management, graphics, and logistics and distribution applications. Part of this thrust reflects an increasing awareness by agency executives of the uses of their information.

Replacement of systems is most noted in office automation, information analysis, and scientific/engineering applications where rapidly changing hardware technology continues to obsolete these systems at a fast pace. Some agencies have planned for new starts in the "traditional" areas of information analysis and administration. In general, these programs represent attempts to bring computer-based productivity improvements to the functional operations of the agency.

EXHIBIT IV-7

APPLICATION BY TYPE OF PROGRAM



Updated 10/87.

D

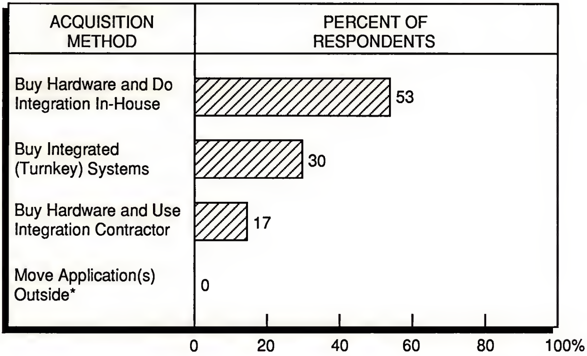
Acquisition Plans and Preferences

Both the agencies and vendors interviewed were asked to comment on their perception of how integration programs are now acquired and how they may be acquired in the future. Half of the agency personnel interviewed preferred separate acquisition of the system components and performance of integration in-house, as shown in Exhibit IV-8. Nearly one-third of the agency respondents preferred acquiring integrated or turnkey systems, representing an increase over previous surveys.

The remainder of the respondents favored purchase of the hardware separately, along with the use of an integration contractor. Several agencies mentioned moving applications to an RCS or a government data center, but this movement is not cited as a preferable method.

EXHIBIT IV-8

AGENCY PREFERENCE FOR SYSTEM ACQUISITION METHODS



*Mentioned as additional method for system acquisition, but not cited as a preference.

Updated 10/87.

The majority of the agency respondents plan to replace or add in-house computers over the next five years. Eighty-one percent stated that some in-house computers would be acquired to support the agency's primary and secondary applications. Most computers were designated as large mainframes or departmental minis and will be competitively procured during the modernization or expansion to occur during the FY 1987 to 1992 timeframe.

The extent to which agencies plan to acquire or use supercomputers was asked of the agency representatives. Sixty-eight percent do not have any planned use of supercomputers within the next five years. Only 26% of the respondents were using the supercomputers currently and an additional 6% expected some future use.

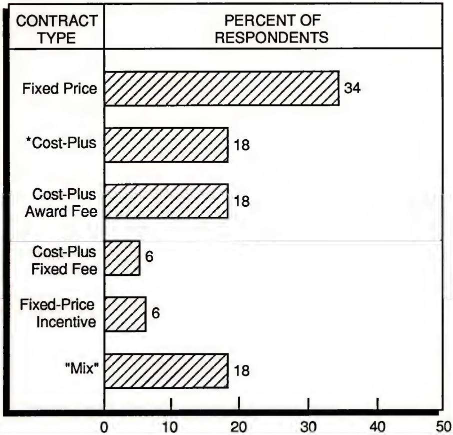
The agencies also were queried on their use of outside computing services. Sixty percent of the respondents are currently using outside computing resources or services to satisfy information processing requirements. Agencies have resorted to use of outside services primarily to alleviate the excess in-house workload for data analysis and scientific applications.

The agencies were divided evenly (38% each) between use of other outside agency centers and remote computer services. Twenty-four percent currently use contractor-owned, contractor-operated (COCO) facilities. Seventy percent of the agencies have plans to convert part or all of these services or applications to in-house over the next five years because of cost justifications.

Agency personnel indicated a continuing preference for a fixed-price SI contract vehicle, as shown in Exhibit IV-9. Interviewees felt there was greater motivation to complete the project on time and within budget under fixed-price conditions. Agencies were evenly divided in their preference for cost-plus and cost-plus-award fee or a "mix" of contract types. Only a small percent of the agencies prefer cost-plus-fixed-fee or fixed-price incentive contracts.

EXHIBIT IV-9

AGENCY PREFERENCE FOR SYSTEM-INTEGRATION-TYPE CONTRACT

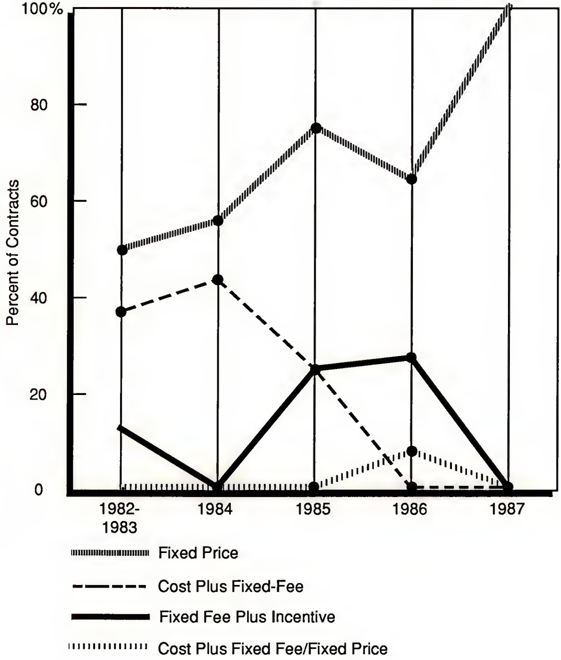


*Did not identify fee type.

Finally, the SI programs analyzed provide some indication of the trend in the contract types. As Exhibit IV-10 depicts, fixed-price contracts have grown in frequency through the previous forecast period and will continue to increase. The CPFF contracts will still show a decline. Other contract types, particularly incentive-based and CPFF plus FP, will be used only as required by specific SI programs.

EXHIBIT IV-10

TREND IN CONTRACT TYPE, 1984-1987

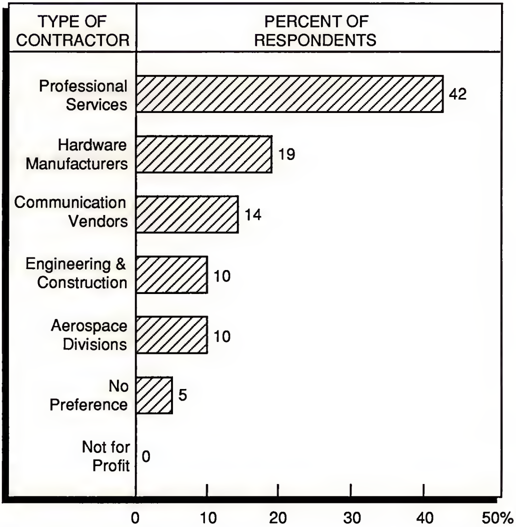


Agencies were strongly in favor of using professional service vendors for SI acquisitions, as noted in Exhibit IV-11. This preference represents a significant shift from INPUT's last survey.

Agencies with prior SI contract experience felt that the systems vendor made design choices that better supported the agencies' operational needs. Presently, hardware manufacturers and communications vendors are used more frequently, whereas the past survey cited that the agencies were more inclined to use not-for-profit organizations.

EXHIBIT IV-11

PREFERENCE FOR TYPE OF SYSTEMS INTEGRATION CONTRACTOR



Bid selection criteria, while varying among agencies and even among specific projects within each agency, usually involved:

- Proposed technical solution; that is, the extent to which the proposed solution meets the requirements.

- Cost, although this is considered by contracting personnel as a primary criterion only when two or more vendors propose similar approaches or equipment. Vendors continue to complain that the government gives "lip service" to total life cycle costs but really buys on the basis of front-end costs.

- The type of contract. As discussed earlier, the contract should be such that the agency has some assurances that costs and/or delivery schedules will not be overrun.

- Risk containment procedures, including adequacy of reporting schemes and progress reports.

The high ranking of life cycle cost and contract type is considered a reaction to the budgetary conflicts encountered on the way to project authorization and funding. Risk containment gains importance under CPFF-type contracts because the government assumes a higher proportion of the risk than under FP contracts.

Exhibit IV-12 shows the relative ranking of systems integration contractor selection criteria by agencies. The vendor ranking appears in Section V, and the two are compared in Exhibit II-5.

The technical solution is identified as the primary criterion for selection by agencies and vendors. Life cycle cost is listed as the second most important criteria but is seldom used in actual contracting practice. Initial cost is frequently the second most important selection criterion. Agency executives mentioned risk containment more frequently than in past surveys, reflecting a growing concern over systems that have "cratered."

EXHIBIT IV-12

SELECTION CRITERIA SIGNIFICANCE FOR SYSTEMS INTEGRATION CONTRACT AWARD*

RANK	CRITERION
1	Technical Solution
2	Life Cycle Cost
3	Risk Containment
4	Contract Type
5	Initial Cost
6	Project Management

Note: Ranking based on average of the level of agency respondents.

*Updated 9/87.

E

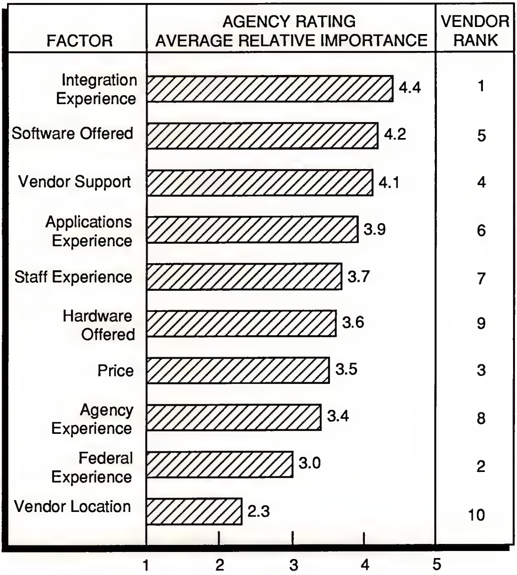
Vendor Performance

Agencies and INPUT clients suggested some variance of opinion about performance criteria and level of satisfaction in pre-research discussions. The vendor ranking of the relative importance of performance characteristics can be seen in Exhibit V-8 in Section V. The relative importance to agencies is shown in Exhibit IV-13.

Both agencies and vendors concur that integration experience is most important and that vendor location is least important. Location was more significant a decade ago under the former ASPRs. There are wide differences of opinion on the relative importance of price and federal government experience, but the remainder of the characteristics do not vary as much. A comparable vendor ranking is shown to the right of Exhibit IV-13 to illustrate the differences for each characteristic.

EXHIBIT IV-13

IMPORTANCE OF SYSTEMS INTEGRATION CONTRACTOR PERFORMANCE CHARACTERISTICS*

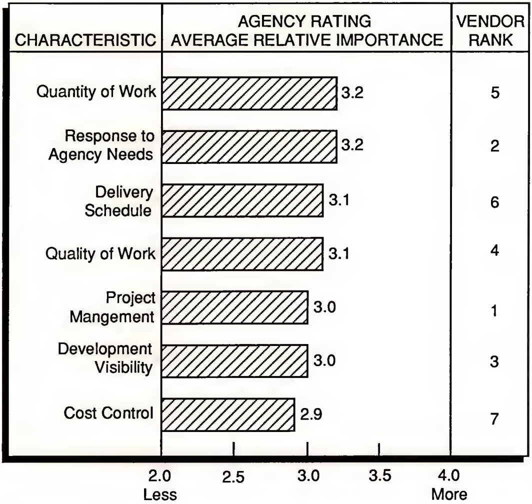


*Updated 9/87.

The second comparison dealt with the perceived level of satisfaction with the work of systems integration vendors. The agency ranking is listed in Exhibit IV-14. The vendor rating is shown in Exhibit V-9 in Section V, but the ranking has been added on the right edge of the agency exhibit (Exhibit IV-14) for comparison.

EXHIBIT IV-14

LEVEL OF SATISFACTION WITH SYSTEMS INTEGRATION VENDORS*



*Updated 9/87.

Vendors apparently agreed with agency levels of satisfaction on responsiveness, work quality, and cost control. Vendors appear to believe that agencies are satisfied with their project management, but agencies are not, even though both concurred that management ranked sixth in selection criteria. Vendor rankings did not change from the previous survey taken in 1986.

Agencies are substantially more satisfied with the quantity of work than with the quality. They assumed that higher quality levels would be a desirable objective for a successful contractor.

F
Trends

Agency representatives were asked to identify technological factors that could or might increase agency utilization of information processing resources. Numerous factors were identified. The six that were named most frequently are listed in Exhibit IV-15.

EXHIBIT IV-15

TECHNOLOGICAL FACTORS THAT COULD INCREASE AGENCY UTILIZATION OF INFORMATION PROCESSING RESOURCES

FACTOR	RANK*
Increased Microcomputer Availability	1
Expanded Networks	2
Expert Systems/Artificial Intelligence	3
Distributed Processing Networks	4
Inter-system Compatibility	5
Software Standardization	6

*Rank based on frequency of mention by respondents.

Updated 1987.

A majority of the respondents identified increased microcomputer availability as the most important factor in increased ADP usage. Expanded networks, expert systems, and distributed processing network availability were considered almost equally important factors. The remaining factors include suggestions for intersystem compatibility and software standardization, which both promote greater utilization of integrated systems.

Agencies were also asked to identify those non-technical factors that tend to impede increased systems acquisition. The various suggestions have been combined into five major factors in Exhibit IV-16. More than half of the respondents identified budgetary limitations as the largest single obstacle. Limitations in funding also contribute to the lack of available skilled staff and the difficulty in retaining them.

EXHIBIT IV-16

NON-TECHNICAL FACTORS THAT IMPEDE INCREASED SYSTEMS ACQUISITION

FACTOR	RANK*
Budgetary Limitations	1
Costs Associated with Acquisition	2
Regulations Imposed on Agency	3
Internal Agreement on Requirements	4
Availability of Skilled Staff	5

*Rank based on frequency of mention by respondents.

Updated 1987.

Fifty percent of the agencies surveyed said that they experienced budget constraints directly attributable to the Gramm-Rudman-Hollings Act. Some agencies had suffered delays and cutbacks in acquisitions since 1986. Other agencies have so far escaped the act's impact.

Costs associated with systems acquisition represent the next largest restraint. Complex or lengthy regulations imposed on the agencies are also viewed as severe impediments to systems acquisitions. Lastly, a lack of internal concurrence and management interest in extending information automation is a substantial hindrance to increased systems acquisition and utilization.

In response to the inquiry on the impact of technical standards, a notable 75% of the agency respondents were of the opinion that industry and governmental activities in the development of technological standards will significantly impact future systems integration acquisitions and operations. The Open Systems Interconnection (OSI) standards and the Government Open Systems Interconnection Profile (GOSIP) protocols will affect system requirements for administrative systems, communications systems, and data processing centers.

ISO and X.3 communications standards for office automation will probably take effect in four to five years. Productivity enhancement tools and integrated workstations will then allow even greater access to data generated from different sites. Also, the X.3 communications and X.12 communications committee Electronic Data Interchange (EDI) standards and systems developments will impact future agency data transactions and computer-aided government logistics operations, both for the civil and defense agencies.

Agency respondents were queried on their suggestions for how vendors might make their professional services more valuable to the federal government over the next five years. As should be expected, the replies varied due to the different types and levels of experiences the respondents have encountered with vendors. In descending order of frequency of mention, Exhibit IV-17 lists the principal suggestions made by the agencies. Increased adherence to industry standards and increased levels of planning and management skills were cited most frequently.

In general, INPUT's findings suggest significant, growing opportunities in the federal government. Agency needs will increase as productivity pressures grow and agency resources become further constrained.

EXHIBIT IV-17

AGENCY SUGGESTIONS FOR IMPROVEMENTS TO VENDOR SERVICES

SUGGESTION	RANK*
Increase Adherence to Industry Standards	1
Increase Planning and Management Skills	2
Increase Level of Experience for Staff	3
Increase Cooperation and Responsiveness to Agency Needs	4
Increase Availability of Compatible Software	5

*Rank based on frequency of mention by respondents.

Updated 1987.

V

Systems Integration Vendors

A

Overview

The federal systems integration market has strengthened and grown since the mid 1980s. The market will continue to be strong through 1992, as a result of the government's focus on upgrading its information resources through purchases of "total solutions" proposed for systems integration and turnkey system programs.

Many of the previously delayed large acquisitions are getting underway, and approved programs are being stretched over longer implementation periods. Wary of cost overruns and late delivery, federal agencies are sharing implementation risks with vendors. Smaller, independent systems are being combined for economies of scale in acquisition and operation. Some systems are being broken up into a number of "indefinite-quantity" requirements contracts.

The revenues from programs awarded in 1986 reflect the start-up efforts for system design and specification efforts, as well as related hardware acquisitions. Although principle business activities and revenue sources overlap in the area of systems integration, most vendors interviewed estimated that nearly 25% of their 1986 federal revenue was derived from systems integration services. Software accounted for an average of 20% of federal revenue. Revenues derived from hardware acquisitions varied considerably among vendors.

Systems integration and turnkey systems vendors differ as to which agencies provide the most attractive market opportunities. Some vendors have narrowed their federal government marketing to only the DoD agencies or selective civil agencies, while other vendors serve a wider range of federal agencies. Over half of the vendors conduct business with

both the DoD and civil agencies. This group may increase over the next few years as more DoD vendors seek to expand their business base to civil agencies. Frequent agency targets for systems integration and turnkey systems include NASA, Air Force, Army, Treasury, and Energy.

B

Market Share

INPUT estimates of the ranking of the ten leading SI vendors, based on GFY 1986 systems integration obligations, are indicated in Exhibit V-1. The estimates are based on agency obligations listed in the Federal Procurement Data Center reports (only) and may not reflect some awards in late FY 1986.

EXHIBIT V-1

TOP TEN SYSTEMS INTEGRATION VENDORS IN FEDERAL ADP SYSTEMS MARKET BY 1986 FEDERAL OBLIGATIONS

RANK	COMPANY
1	IBM
2	Computer Sciences Corporation
3	Hughes
4	Rockwell
5	Boeing
6	CDC
7	TRW
8	HIS
9	Martin Marietta
10	SMS

Based on OMB/Federal Contract Reporting Center data.

Updated 9/87.

A number of major multi-year program awards made prior to FY 1986 contribute to the relative ranking of key SI vendors.

- Army's VIABLE award to the EDS-led team of IBM and ADR is expected to continue to grow to more than $1 billion.
- Air Force Phase IV award to the Sperry (now UNISYS)-CSC team is expected to grow to nearly $2 billion.
- FAA's Air Traffic Control Automation Program outlays are estimated to reach $12 billion by the year 2000; Martin Marietta's SE&I contract is valued at $640 million for the first ten years, with a ten-year renewal option.
- Social Security Administration's Systems Modernization Program could exceed the earlier estimates of $650 million; systems integration contract to EDS may grow to $100 million. However, current Congressional concerns may delay this program.
- Navy's Inventory Control Point program award to EDS/IBM could reach $350 million, not including code conversion, testing, and work packages, for the base contract of eight years, with two eight-year renewal options.
- Navy's STAFS award to the CSC/DEC team could grow to more than $230 million.
- WWMCCS Information System Integration contract to GTE is expected to exceed $600 million.
- Navy's enlisted Personnel Administrative Support System (PASS) was awarded to Martin Marietta for $230 million.
- Patent and Trademark Office's integrated office effort awarded to MITRE (system engineer) and PRC (system integrator) could cost more than $280 million, depending on conditions associated with renegotiation of the cost-reimbursable contract.
- FEMA's National Warning System upgrade was awarded to Harris for $109 million.
- BDM won the initial $16 million phase of the Requirements Data Bank project of the Air Force Logistics Command, which is expected

to exceed $120 million by completion.

Recent 1986-1987 awards are listed in Section VI-B. Among the most notable are:

- The Technical Management Information System at NASA's Johnson Space Center, with a value of $330 million, won by Boeing.

- Army Project 80X, Phase II for $343 million, won by EDS.

Turnkey systems for non-custom specialized applications represent a much smaller but important segment of the federal integration market. Exhibit V-2 presents INPUT's estimate of leading vendors.

Risk involvement to the agencies is substantially lowered by the use of a turnkey systems vendor. Requirements are better defined and attractive to smaller vendors. Many well-known vendors have entered this market.

EXHIBIT V-2

TOP TEN TURNKEY SYSTEMS VENDORS IN FEDERAL ADP MARKET*

RANK	COMPANY	PREVIOUS RANK
1	Federal Data	8
2	C3, Inc.	2
3	Computervision	1
4	Prime	9
5	Intergraph, Inc.	3
6	Computer Consoles	6
7	Gould	-
8	Harris	10
9	Tektronix, Inc.	4
10	Triad	7

INPUT estimates based on OMB/FPDS data.

*Updated 9/87.

C3 Inc. is one of the better-known integration specialists in the market. In some cases, a smaller part of major systems integration vendors' revenue comes from turnkey installations (BDM, CSC, PRC, SAI). Many of the recent turnkey system awards have been made to small business and 8A firms under the government's set-aside programs.

C

Attractions of Federal Integration Contracts

Both federal government-based and non-federal government-based vendors are attracted to the federal systems integration market by its growth potential and related benefits, as shown in Exhibit V-3. Almost half of those interviewed cited anticipated growth as a key factor.

Past SI program success was listed by about one-third of the respondents, although they did not define what success meant to them. The opportunity to apply new information technology to government needs was the next most frequently cited factor. Other reasons for remaining in or entering the market include:

- New procurement policies.
- Career path prospects.
- Long-term involvement.
- Unique applications.
- Contract size.
- Increasing opportunities for subcontractor specialists.
- Training prospects.

Some vendors voiced concern about the potential role of IBM in the SI market, specifically:

- The existence of a large, obsolete IBM inventory that is not upwardly compatible with most mainframes of other vendors.

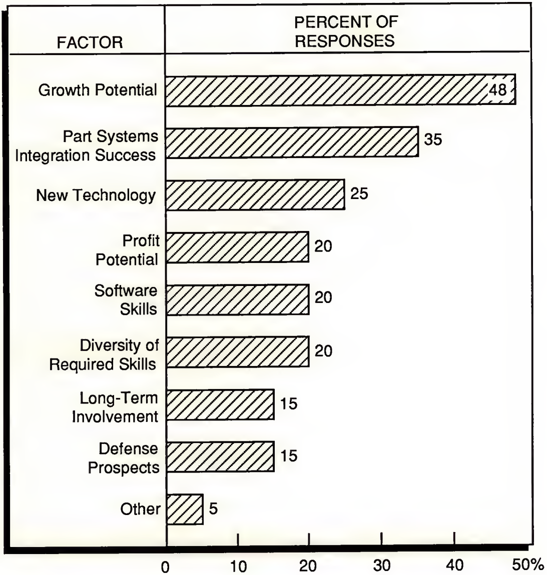
- Future opposition to IBM by the House Government Operations Committee could be less than in the past, considering the reduction of IBM's government share.

- Continuing changes in IBM pricing strategy offer attractive savings to the government.

- Limited IBM maintenance interests suggest that IBM may team with systems or TPM vendors for post-installation support.

EXHIBIT V-3

FACTORS INFLUENCING DECISION TO ENTER OR REMAIN IN FEDERAL SYSTEMS INTEGRATION MARKET



- The IBM move to establish in-house software capabilities along with outside vendors is expected to accelerate the availability of a wide spectrum of applications software.

D

Commercial versus Federal Systems Integration

The federal government has increasingly relied on systems integrators to develop, upgrade, or replace automatic data processing systems in the past decade. Commercial systems integration, with some of its roots in Federal SI, has striking similarities and differences with government contracting (see Exhibit V-4).

The commercial sector client is less likely to have the legal or technical background required for many projects, and when this knowledge is available it is only available in pieces from numerous personnel within the client organization. On the other hand, in the federal government the thrust has been the establishment of project offices that include both technical and legal representatives that speak for the sponsoring agency. Fewer interfaces are required.

Vendor characteristics differ as well. A key difference is the formality with which vendor reputation is evaluated as a part of the bid selection procedures in the federal marketplace. In most cases, a vendor's estimated versus actual performance on cost and schedule measures is recorded (the Defense Contract Audit Agency does this for Defense, but makes the evaluations available to all agencies). Agencies use this historic information to specifically and formally weigh the vendor's past performance. In the commercial world a federal track record of successful implementations is highly desirable and leverageable.

The vendor's customer base is much more leverageable in the commercial sector in that the client, for the sake of cost, will not venture too far technically from the existing IS environment. This conservatism is not necessarily the case in the federal sector where the demands for competitive bidding seem to outweigh "easy" interfacing of new systems by contracting with the current vendor(s).

The requirement for competitive bids for expenditures over $25,000 in the federal sector has no counterpart in the commercial world. Although competition is a vehicle for the client to achieve the best solution at the best price, other factors (vendor reputation, comfort level with the vendor, etc.) do come into play to a far higher degree. Furthermore, the requirements for competition are such that agencies may not generally name specific products in the RFP. So, at once, the federal process is

EXHIBIT V-4

COMMERCIAL VERSUS FEDERAL SYSTEMS INTEGRATION CHARACTERISTICS

CHARACTERISTIC	COMMERCIAL	FEDERAL
Customers		
Requirements Knowledge	Low	High
Technical Knowledge	Variable	High
Interface	Multiple	Single
Vendors		
Vertical Expertise	Preferred	Mandatory
Customer Base	Leverageable	Reference
Conceptual Strength	Required	Optional
Reputation	Media-Based	Historic
Business Conditions		
Competitive Bids	Optional	Required
Bid Complexity	Variable	High
Expenditure Commitment	Deferrable	"Guaranteed"
Risk Exposure	High	Contained
Contract Type	Fixed-Price	Combination
Price Restrictions	Competitive	Ceilings
Bonuses	Unlikely	Awd./Incent.
Penalties	Unlikely	Exception

more open and public, fostering a great deal of competition in which discounting is frequent.

Competitive bidding in the federal sector makes for bidding complexity that involves more time, effort, and money on the part of the vendors. Once the process starts in the federal sector, the expenditures are virtually guaranteed. This virtual certainty is not the case in the commercial area where expenditure commitments may be deferred or withdrawn at the client's choosing.

The risks to the contractor appear to be much greater in the commercial marketplace. The rigid rules of contracting that are in play in the federal arena lead to compliance with the "letter" of the specifications. The absence of these rules in the commercial marketplace creates an environment where the "spirit" of the specifications is more at issue and, consequently, more subject to interpretation (and misinterpretation), creating a greater chance of contract performance suits.

Federal regulations specify price ceilings. Some regulations specify that profit can be no more than 15% and/or that the government must be treated as a "most favored" customer by receiving the vendor's best price. Regulations permit agencies to audit vendor records to verify these conditions.

Vendor capabilities in the commercial sector are usually based on written proof, previous success testimony, or live systems demonstrations emulating a critical function of the desired system. In the federal marketplace these capabilities are frequently required to be "proven" by actual performance against standards (benchmarks) established for the project's system or by "shootouts" against competitors.

Pricing strategies differ in that commercial jobs are frequently fixed-price without bonuses or penalties. Government contracts are typically fixed-price for very small and very large jobs, but a combination of fixed price and cost-plus for medium-sized jobs. Further, it is not unusual for the government to reward a contractor for a low-priced bid (award fee) or to provide incentives for beating cost or schedule estimates.

In-depth reviews of component performance are frequently contracted by federal agencies as a means of verifying/validating a contractor's work. This practice will be less frequent in the commercial arena.

In summary, then, the commercial/federal distinctions revolve around the formality and regulatory backbone of the process. Although it remains to be seen which, if any, of these more formal practices of the federal market are adopted by the commercial market, it is clear that commercial clients will quickly adopt practices that protect them.

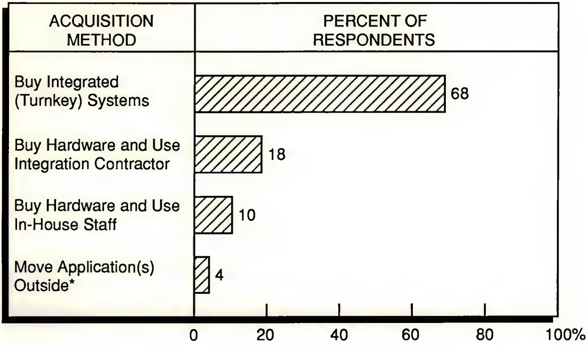
E

Federal Acquisition Practices

The vendors interviewed were asked to comment on their perception of how the federal government is now and will be acquiring integration programs. Two-thirds of the vendors believe that future ADP systems will be acquired as integrated systems, as shown in Exhibit V-5.

EXHIBIT V-5

VENDOR VIEWS OF FUTURE SYSTEMS INTEGRATION ACQUISITION METHODS



The SI contractor has prime responsibility, but may use specialized subcontractors and suppliers for:

- Design.
- Hardware acquisition.
- Software development.
- Site preparation and installation.
- User staff training.
- System maintenance (at least during warranty period).
- Hardware systems bought competitively by the agency.
- Separate contracts awarded for site preparation, conversion of existing applications software, validation, and verification.

The piecemeal development of systems is an attempt to make large integration projects less visible.

Whatever the scenarios are that each vendor holds, most agree that the revenue potential of systems integration opportunities will increase. By agency, the largest increases will continue to be with defense agencies, because defense requirements will continue to call for complex solutions. However, as one vendor pointed out, some civil agencies have too many other problems and too many end users to make it practical for the agencies to either ignore systems integration needs or attempt solutions in-house. By application, vendors see opportunities in communications systems, including integrated offices and distributed data processing; in integrated architectures that tie together data bases; and in the analytic tools that create decision support systems.

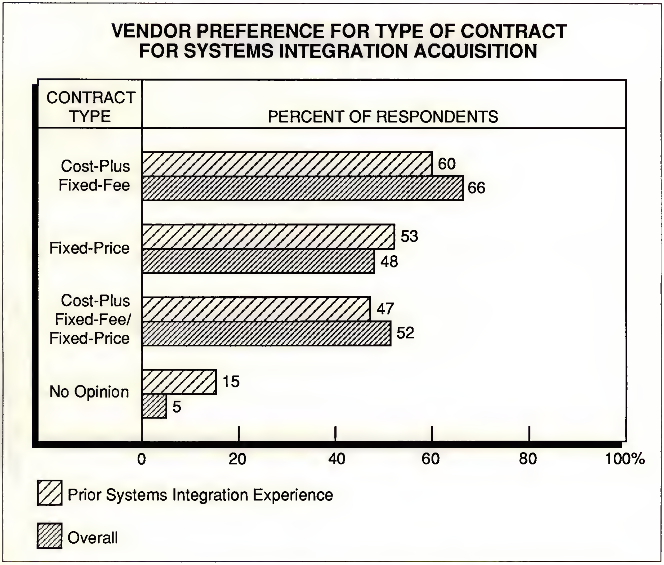
About two-thirds of the vendors prefer cost-plus-type contracts for government systems integration programs, as shown in Exhibit V-6. Although cost-plus contracts regulate the margin of profit allowed, they clearly place the risk within government.

The long gestation period for the approval and funding of medium- to large-scale ADP systems (notwithstanding GSA's "go-for-12" program) supports the placement of risk on the buyer for several reasons.

- Availability of newer technology.
- Increase in number of applications.
- Increase in number and variety of interfaces with other systems.

Several respondents noted the increasing SE&I awards to nonprofit organizations. Some awards involve nonprofit organizations as SETA

EXHIBIT V-6



experts to review SE&I contract progress. Only about one-fifth believe that the government will use systems engineering and integration (SE&I) contractors. About 10% think that some agencies with staff ADP expertise will acquire hardware systems and perform systems integration in-house.

The agency respondents have expressed a greater interest to perform in-house integration since the earlier report. The Department of Energy is the major proponent of this approach. Some agencies in the Department of Commerce also plan to do in-house integration. Also, very few see agencies moving new system requirements to outside sources (RCS, COCO, and other government data centers).

The vendors interviewed for the 1987 update to the report perceive two forces impacting this market. On the one hand, agencies are under pressure (REFORM 88) to find new productivity savings in ADP. Agencies have read the Grace Commission report on the importance of automation. Moreover, they recognize the shortening life cycle of hardware and software and the ever-quickening pace of technology. Furthermore, at this writing REFORM 88 initiatives with related Grace Commission findings are still driving federal information systems modernization. Vendors envision more computer systems tied together to exchange information.

Agencies also realize that staff reductions hurt the agencies' abilities to develop the needed systems in-house. Ever-increasing end-user involvement adds to an already crowded backlog of systems to be developed. Tight budgets too, force constant re-examination of in-house and contractor expenditures.

The outcome of these forces will shape the systems integration market in the coming years. Although no vendor has the crystal ball to foresee this future, each has scenarios of what could unfold. Components of the various scenarios include:

- An after-the-fact realization that the new systems currently being designed and implemented are not satisfactory—because of hardware/software advances or poor original designs—and must be replaced.

- A decline in hardware and packaged software prices that makes it easier to make systems buys.

- A reduction in agency system requirements and expectations that permits acceptance of packaged, off-the-shelf solutions and/or the further development of modifiable packages coupled with the systems support tools to make the modifications.

- Additional attempts to do systems integration jobs in-house or with the aid of not-for-profit integrators.

- Conversion of current software complicated by hardware and/or operating system changes.

About half of the vendors would bid on fixed-price contracts when:

- Requirements are fixed.
- The agency has experienced in-house staff.

- Hardware upgrade is compatible with existing systems.
- No system currently exists.

About the same number of vendors see a mix of CPFF and FP as desirable when risk-sharing shifts during implementation.

- Design and development—CPFF.
- Software production—CPFF.
- Hardware and maintenance—fixed price.
- Straightforward (upwardly compatible) code conversion—fixed-price.

Vendors with good SI experience appear more willing to bid by fixed-price because they believe they have devised better risk containment procedures. They use carefully worded and detailed project scope and work statements. The vendors spread the risk among all first-tier and major second-tier subcontractors and suppliers. They also devise and adhere to detailed Work Breakdown Schedules (WBS). Lastly, vendors delineate the system requirements being met and how they will be satisfied.

Until relatively recently, SI contract awards have generally been made to the lowest (price) bidder. Concern with potential "buy-ins," severe cost overruns, and defaulted contracts led to two-step and four-step negotiated procurement policies on large systems, especially in the Defense Department. However, buy-ins still occur fairly frequently.

Vendor response to the relative importance of the six key contract criteria is shown in Exhibit V-7. Vendor ranking was based on recent experiences with significant programs, and excluded some smaller procurements that deviated from the standard pattern of procurement. As perceived by the respondents, the proposed technical solution remains the controlling criterion in selecting a turnkey system or systems integration vendor .

Life cycle cost has become the second most important factor, especially with the increase in large, multi-year acquisitions. Risk containment measures remain increasingly important to buyer and bidders. Buyers are increasingly requiring bidders to bear more risk, to the point where bidders are increasing bids dramatically or refusing to bid at all on some jobs.

EXHIBIT V-7

SIGNIFICANCE OF SELECTION CRITERIA FOR SYSTEMS INTEGRATION CONTRACT AWARD*

RANK	CRITERIA
1	Technical Solution
2	Life Cycle Cost
3	Risk Containment
4	Initial Cost
5	Contract Type
6	Project Management

*Updated 9/87.

F

Vendor Performance

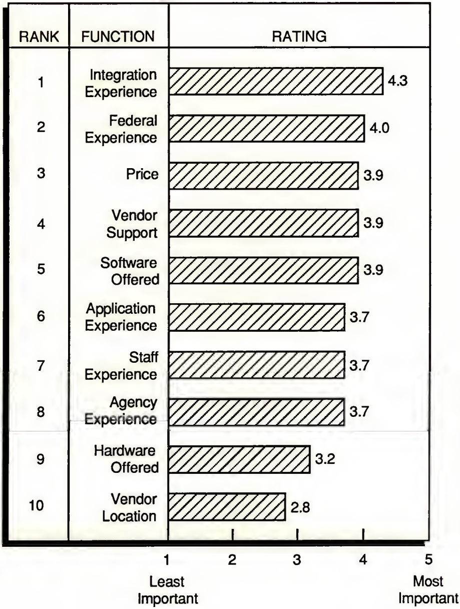
In pre-research discussions with agencies and clients, there appeared to be some difference in opinion about contractor performance on past and current SI programs. From lists compiled with both groups, performance areas were chosen for inquiry. Vendor perceptions are ranked in importance in Exhibit V-8.

Prior integration experience and its benefit to overall contract performance was rated most significant by vendors and experienced agencies. Vendors should assure that sound engineering practices were employed and that problem areas were identified early. Contractors should provide the agency with better visibility of progress .

Vendors believe that federal contract experience is next most important, although ranked ninth by the agencies. Federal contract procedures are more complex than commercial procedures, and vendors find the experi-

EXHIBIT V-8

VENDOR RATING OF IMPORTANT VENDOR PERFORMANCE CHARACTERISTICS



ence valuable in approaching future contracts. Documentation delivery throughout the agency contract is more rigidly observed, as are other procedural differences.

Price, vendor support, and software offered were held as equally important, but with somewhat more emphasis on price. Price was interpreted as staying reasonably close to the bid figure without consideration of agency-directed or contractor-proposed changes. Vendor support included response time for service calls, proximity to the installation, and management commitment.

Experience with the intended applications, the agency and its mission, and the contractor staff backgrounds were also similar in importance. Establishing a rapport with the agency project team and the ultimate user is more rapidly established and easier to maintain. As a result, operating objectives are better understood and met by the system, and program execution is smoother.

Hardware systems and vendor location have less importance to the vendors in the survey. In replacements, the selected hardware tends to be compatible with the existing system. In new systems, hardware and hardware systems were selected or defined in the design phase. The importance of vendor location, once a major criterion in the 1970s, is much less significant to vendors and agencies alike.

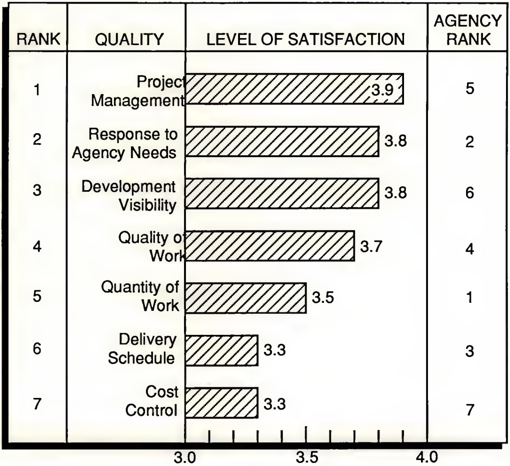
Related to the importance of vendor characteristics is the agency's level of satisfaction with specific areas of vendor performance. Seven criteria were selected for evaluation by both groups. Vendor perceptions of the agencies' level of satisfaction are indicated in
Exhibit V-9.

Project management continues to be rated as most significant by most of the respondents. Defaults occur when vendors fail to adequately manage the project. Agencies react more favorably to strong project management. Successful SI vendors believe agency satisfaction with project management was a key factor to success.

Responsiveness to agency needs and agency visibility of progress and problems were viewed as next most satisfying on successful projects. Agencies were more amenable to schedule adjustments and contract changes when satisfied with performance in these areas.

EXHIBIT V-9

AGENCY LEVEL OF SATISFACTION WITH SYSTEMS INTEGRATION VENDORS— VENDOR VIEWPOINT



Ratings on other factors show that the quality of work was held as more significant than quantity, since quality generally minimizes costly rework to overcome errors, especially in software development and interface definition. Also, agencies appear to vendors to be less satisfied with vendors' delivery schedules and cost control. These two factors are the most visible outward signs of project progress and are open to criticism from a wider spectrum of government oversight groups.

The industry respondents were asked what they believe vendors need to do over the next five years to make their products and services more valuable to the federal government. The replies varied due to the different types and levels of experience the vendors have encountered with the federal agencies.

In descending order of frequency of mention, Exhibit V-10 lists the principal suggestions made by the respondents. Improved adaptation of standards was cited most frequently as a suggested means of making vendor services more valuable. Since this improvement was a major concern voiced by agencies, it appears to be a positive step in enhancing satisfaction levels.

EXHIBIT V-10

SUGGESTED IMPROVEMENTS TO PRODUCTS AND SERVICES

SUGGESTION	RANK*
Improve in Adaptation of Standards	1
Improve in Compatability and Interoperability of Systems	2
Improve Software Program Efficiency and Visibility	3
Improve Productivity and Reliability	4
Improve Management and Reporting Capabilities	5

*Rank based on frequency of mention by respondents.

The vendors also noted the development of greater compatibility and interoperability of systems. Additional comments by vendors included having greater flexibility in systems. Many of the suggestions made by the vendors were similar to those made by the agencies. To the extent that these steps aid the vendors' ability to be responsive to agency needs, these measures will be well-received in the federal market.

G

Trends

The vendors interviewed for this report update were asked to identify technical and non-technical trends that might specifically influence the federal marketplace and systems integration procurement . As should be expected, the perspectives varied with the primary level of business and the degree of involvement in SI.

Technical trends that were identified were of a wider variety than non-technical. In descending order of frequency of mention, there were several principal trends as identified in Exhibit V-11. Microcomputer revolution or expansion was cited the most often. Vendors cited the increase in microcomputer products and more powerful microcomputers as significant to the future development of the systems integration market. Use of microcomputers will emphasize software transportability. Also, with the aid of economical LANs (Local-Area Networks), the density of PCs will accelerate implementation and use of distributed processing.

Vendors view the increased emphasis on development of expert systems and artificial intelligence by the military and similar demands from the regulatory agencies as the next most significant technical factor. Developments in optical disk storage will also have an impact over the next five years. There is much interest in faster and cheaper large-memory systems, with demand exceeding the development rate of optical techniques.

The government's unique requirements are pushing advancements in technology. Technological efforts toward achieving greater interconnectivity and compatibility of networking processes will accelerate into the early 1990s. Interconnectivity of systems will be emphasized for rapid data transfer. There will be further development of transparent networks and/or standard protocols such as OSINET (Open Systems Interconnect Network) and MAP/TOP (Manufacturing Automation Protocols/Technical and Office Protocols).

EXHIBIT V-11

TECHNICAL TRENDS THAT IMPACT FUTURE SYSTEMS ACQUISITIONS

FACTOR	RANK*
Microcomputer Revolution or Expansion	1
Increased Emphasis on Development of Expert Systems and Artificial Intelligence	2
Developments in Optical Disk Storage	3
Increased Efforts toward Greater Interconnectivity and Compatability	4
Developments in Secured Communications Transmission Media	5

*Rank based on frequency of mention by respondents.

Technological developments in secured communications transmission media were also noted as an important factor by vendors. The technological advancements in hardware, and especially in supercomputers, was noted by just a small percent of respondents. However, nearly 70% of the vendors surveyed have future plans to include supercomputers in their systems integration or turnkey service offerings over the next five years.

Non-technical factors that will impact the direction and growth rate of SI acquisition were less diverse but considered more significant to the 1987-1992 era. Budget trends and widespread concern with potential actions by Congress and the Federal Reserve were the most significant citations:

- Some deficit control measures could markedly reduce ADP budgets across all agencies, as typified by budget cuts in the past several years, including those of Gramm-Rudman.

- Any reduction in U.S.-USSR tensions may sharply reduce defense spending in all categories.
- Unless opposed successfully by the unions, a reduction in the government workforce could accelerate vendors' introduction of new ADP technologies.

Other factors that will influence the federal marketplace are:

- AT&T deregulation and the resurgence of IBM in the marketplace could quickly reduce the competition to subcontractor status (if they remain in business).
- Imposition of the new FIRMR next year will require better training of more ADP/telecommunications-oriented acquisition and contracting personnel in the government, as addressed in the Senator Quayle Amendment of the GFY 1986 Defense Authorization Act.
- Foreign competition in both ADP and telecommunications could accelerate the price reduction for hardware and, later, software. This acceleration could result in improved cost/benefits to the government.

Congressional micromanagement of ADP continues to change the balance of competitive forces in the marketplace. The "Buy-Not-Lease" provision of the 1984 Defense Appropriations Act could negatively impact leasing vendors and improve prospects for SI vendors if supported by subsequent appropriations. OMB will continue its reluctance to enforce a single set of acquisition regulations on all agencies with no exceptions.

Also, Congress will become more interested in forcing a range of socioeconomic contract terms on a high-technology industry. In particular, Small Business and Eight (a) set-aside programs will increase. Endless congressional studies and investigations of every major system acquisition will be fostered, including the political aspects of new system features. Vendors may be required to assume more risk without passing the risk back to the agency in the form of higher-priced bids. Vendors therefore need to establish and maintain relationships with other similar vendors, many of whom offer expertise in very technical areas and/or have the off-the-shelf package that, when modified, could result in the required solution. Teaming relationships will continue to grow.

Perhaps the most serious business issues facing turnkey systems vendors are the narrow margins on "value-added" systems and the lack of sufficient recurring revenue. The first problem not only means that turnkey systems are inherently unprofitable, but also that they provide no flexibility in pricing. Both of these results make vendors highly vulnerable to hardware manufacturers' actions.

The drastic pruning of R&D budgets in 1985 that reduced the flow of new products will continue to have multi-year impacts on many vendors. In recent years, turnkey systems vendors were able to maintain price levels while the cost of hardware was declining. But as this strategy fell apart in 1985, price/performance pressures increased and will likely continue to do so in future years. As with software products, turnkey vendors are trying to move their revenue base to recurring revenue.

INPUT believes there is a real question as to the viability of the value-added reseller (VAR) concept. Few of these companies appear to be profitable—there is high turnover and the benefit to the manufacturers may be short-term and questionable.

One fundamental problem is that the VARs do not charge enough for the "value added." Typically, hardware costs to the VAR are of the order of 40% of the delivered sale price. INPUT considers that hardware costs need to be about 20% in order to have sufficient margin for sales, support, marketing, software development, integration, operations, and profit.

The second fundamental problem is that unlike most turnkey vendors, the VARs do not add enough value, making it very difficult to achieve a profit margin. However, if a VAR does achieve that margin, it is almost immediately attacked by head-to-head competitors who offer the product at a substantial price reduction. INPUT research has shown that it is very difficult to retain price differentials of more than 25% in comparable products.

This problem is exacerbated by manufacturers who do not support exclusivity and indeed seem actively to work against it. This behavior probably exists because they wish to keep the VARs under control. "Divide and conquer" seems to be the spirit.

The problem is that the failure of VARs damages the manufacturer's reputation in the user community. The only VARs that seem successful as a group in terms of profit and stability are those that have associated

services. For these companies, a turnkey system (through a VAR relationship or otherwise) is simply another vehicle to deliver a solution, and because of strong customer relationships, profit margin and recurring revenue goals can be attained.

In the turnkey market, the use of standard hardware from vendors such as IBM is the basis for most products. However, INPUT believes there is a real case to be made for custom hardware-based systems. The immediate reaction of most services companies to this concept is rejection—"I don't want to be in the manufacturing business" is the response.

The "custom hardware" can actually be almost the same if not identical to the product from the computer manufacturer. Indeed, one can buy the boards that the computer manufacturer uses in some cases. Intergraph is buying DEC VAX boards for a few thousand dollars and assembling them into its own "boxes" instead of paying over $100,000 for a VAX computer. Further, many vendors are currently "TEMPEST-ing" VAX computers.

Some problems are conceivable. Maintenance is not a problem, however, in that user self-maintenance, remote diagnostics, depot maintenance, and other techniques can be used, not to mention third-party maintenance (TPM) organizations. Inventory, of course, can be a problem. Volume is necessary to keep the cost of the custom systems at the appropriate level.

A strategy could be used to build volume with low margin using the manufacturer's standard product, then move to a "plug-compatible" custom system as an option to the buyer with a substantial price advantage. The advantage of this process is that it reduces the hardware component to the level at which appropriate profits can be made.

In general, the key to the use of custom hardware is that it can operate the standard manufacturer's software. In other words, it must be plug-compatible or, ideally, based on the manufacturer's subassemblies.

H

Vendor Goals and Opportunities

SI offers federal vendors the opportunity to capture agency accounts. Because of the critical importance of these systems to the end user and because the duration of the contract will be multi-year, the vendor has an excellent opportunity to develop a unique customer relationship that can transcend existing relationships.

Whoever controls the SI will be well-positioned for project downstream expenditures. The SI/user relationship becomes so intimate, the contractor's knowledge of the agency's environment so detailed, and the agency's dependence on the contractor so strong that long-term relationships seem inevitable. This greater account control will also provide the vendor with an increased ability to fend off competitive incursions.

Moreover most —if not all— SI projects are such that no single vendor can expect to satisfy the user's requirements alone. As a result, lasting relationships will be formed that will be difficult to compete against or break. It is therefore crucial for vendors to choose, early on, partnerships that serve their best long-term strategic interests.

To properly prepare for the federal SI competitive environment over the next five years and beyond, vendors now must choose the envelope of services, agencies, and skills that will be the focus of their SI efforts. Vendors can then isolate those capabilities, products, and services that are needed to complement their own catalog and can begin selection of the ideal partner or partners that can not only provide the skills needed but enhance the vendor's image and therefore the likelihood of obtaining business.

I

Strategies for Success

There are several key strategic elements to be considered in entering the federal SI market. Containing the risk element and consciously managing each project to reduce the possibility of failure is an essential part of continued participation in the market. The vendor's reputation plays a key role in the proposal evaluation process.

To be successful in the federal SI market, the vendor must demonstrate a comprehensive understanding of the federal information systems acquisition process. This strategy clearly means that systems design, programming, project management talent, etc., is the second most important component of the vendor's makeup, the first being a ground-level understanding of the procurement rules.

1. Growing Demands and Staff Shortages

Demands from all corners of the agencies for additional MIS support are ever-increasing. Information systems have moved to the very heart of federal missions and now require better solutions for such divergent applications as:

- Networks that tie inter- and intra-agency groups together, especially in large, geographically dispersed companies, and networks that tie government buyers and sellers together for the electronic exchange of data than ranges from orders to invoices, bills of lading to receipt-of-goods acknowledgements, and the like.

- Document exchange capabilities among various media (data, text, image), multiple layers of computing (personal, departmental, and agencywide), and various types of equipment from a multitude of vendors that permit the development of efficient and effective office information systems.

Many of the existing data processing systems lack the transaction speed and size to satisfy requirements. The aging of equipment in the face of increasing demands requires that obsolete systems be replaced on a timely basis. This concern becomes all the more urgent as technology advances and offers new capabilities. "Supersystems" that integrate several applications bound to fourth-generation languages, agency data base management systems, data that ranges from the personal level to the agency level and beyond, and end-user tools that range to intelligent workstations requiring mainframe links have all moved from the "desirable" to the "necessary" category.

Although many federal executives exhibit a desire to apply these technologies, few total solutions are available to link information systems to overall agency plans. And, to the chagrin of many organizations, the internal-staff skills to handle the technical demands of these integration efforts are weak or unavailable.

This lack of skills seems to occur subsequent to A-76 policies that have reduced in-house technical staff, particularly at central design activities. Hiring freezes dictated by budget cuts (including the GRH effects) have reduced agency capabilities of maintaining existing systems. Where the systems are critical to mission fulfillment, development efforts continue with little regard for current budget impacts.

In most cases, demand for new and better systems has outstripped the ability of the internal staff to meet the requirements at all, let alone on time and within budget. The staff is simply too mired in day-to-day operations to meet new requirements. Even if staff time were available, the complex problems often require multi-vendor solutions that are outside the capabilities of the personnel. And, internal development can be costly in terms of delays in other, less critical projects.

2. Pervasiveness of Information Systems

Agency management has shown an increasing desire to automate the very core of its mission activities, thus demonstrating awareness of the need for (even necessity for) automation to fulfill the mission. In the current constrained budget environment, agencies cannot wait for internally developed solutions in such areas as financial decision support, support to the public, and management reporting.

This pervasiveness has also brought forth a concern for the proper management of the agency's information systems assets (spurred by the Paperwork Reduction Act), including hardware, personnel, and data/information. Agencies have moved from a reactive to a proactive orientation. This new orientation requires the containment of costs and the leveraging of assets, the reduction of maintenance costs, and the prioritization of development efforts.

3. Demands for Productivity

Management has also focused on increasing productivity throughout the organization. Managements feel that part of the problem with the lack of growth in output that has followed significant investments in information systems is the technical-absorption bottleneck. The absence of a strong agency IS plan (despite A-130 requirements) has led to fragmented systems, and the proliferation of "solutions" has caused not only confusion among possible directions but also more-fragmented systems from packaged solutions that are not a good fit.

From the agencies' perspective, then, systems integration has several attractive characteristics, as shown in Exhibit V-12. First, the integrator assumes the risk of development. At once, this starts to relieve the client of the worry that the system will be built at all and provides greater assurance that the project will be completed on time and within budget. If the integrator fails for any reason, the agency client is risking only the time and money to the point of failure.

EXHIBIT V-12

ATTRACTIVE CHARACTERISTICS OF SI APPROACH

- Meet Mission Objectives Rapidly
- Reduce Risk of Systems Development
- "Acquire" Project Management Skills
- Integrate Fragmented Systems
- Save Costs over Internally Developed Solutions
- Use New Technology to Achieve Optimum Solution

The agency also hopes to be relieved of the time-consuming and potentially confusing logistics of finding and controlling several contractors. The assumption is that the integrator has or will develop solid business and technical relationships with the vendors who will be involved in the solution and that these relationships will smooth the interaction of multiple vendors. In the worst case, these vendor problems get passed on to the integrator, not to the client.

In an SI effort it becomes the integrator's responsibility to integrate divergent and incompatible products. This arrangement may require a level of technical sophistication that the user organization does not possess. Office information systems, for example, require a strategic office systems architecture that incorporates and interconnects multiple media, levels of computing, and functionality. These electronic offices require highly advanced communications and integration of data, information, and knowledge bases.

The agency also hopes to capitalize on the integrator's industry and applications experience in both the development and post-implementation phases. The project involves state-of-the-art and state-of-the-industry expertise that the vendor will bring to the effort.

The agency views the potential economies of scale offered by the integrator as a plus. If an integrator is working on multiple projects or has an established distribution channel for products from other vendors, it is likely that products/services are being acquired in such volume or with such regularity that the integrator will get a "price break" that will be passed on to the client.

A systems integration approach also solves the lack of in-house project management skills. INPUT studies consistently show that data processing management feels that project management skills and certain technical skills, especially systems design, are lacking in their agencies. Many, if not most, MIS departments have a mediocre record of completing major projects on budget and on time. SI solves this problem by transferring responsibility to a third party that can demonstrate these skills.

VI

Key Opportunities

This section describes specific opportunities in the federal information technology market. Three lists of programs are provided.

- Recent Awards.
- Future Systems Integration Opportunities.
- Future Turnkey Systems Opportunities.

Although neither opportunity list is all-inclusive, both consist of major programs that are typical of the federal market.

The list of opportunities becomes smaller after FY 88 because new programs have not yet been identified or initially approved by the responsible agency. Subsequent issues of this report and the INPUT Procurement Analysis Reports will include additional programs and detailed program information for FY 1988 to FY 1992.

A

Present and Future Programs

New information technology programs that are larger than $1-2 million are listed in at least one of the following federal government documents:

- OMB/GSA Five-Year Plan, which is developed from agency budget requests submitted in compliance with OMB Circular A-11.

- Agency long-range information resource plans developed to meet the reporting requirements of the Paperwork Reduction Act of 1980.

- Agency annual operating budget requests submitted to congressional oversight and appropriations committees based on the OMB A-11 information.

- Commerce Business Daily for specific opportunities, for qualification as a bidder, and to obtain a copy of an RFP or RFQ.

- Five-Year Defense Plan, which is not publicly available, and the supporting documentation of the separate military departments and agencies.

- Classified program documentation available to qualified DoD contractors.

Turnkey systems and systems integration opportunities may not be identified specifically as such in these documents.

- Information technology planning documents usually identify mission requirements to be met by specific programs rather than methods for meeting these requirements.

- Some mission requirements could be satisfied equally well either by custom system development or by turnkey system acquisition.

- An agency decision to use a systems integration contractor may not be made until a program is well under way and an acquisition plan has been formulated. Over the last several years, however, agencies have shown an increasing tendency to use systems engineering and integration contractors for larger, more complex systems.

All funding proposals are based on cost data of the year submitted, with inflation factors dictated by the Administration as part of its fiscal policy, and are subject to revision, reduction, or spread to future years in response to congressional direction. Some additional reductions will be likely in FY 1988 and beyond due to the deficit reduction constraints of the Gramm-Rudman-Hollings Act.

B

Recent Awards

Agency/Program (PAR Reference)	Contractor(s)	Value ($ M)
DoD/DSD/Composite Health Care System	SAIC, McDonnell Douglas, Technicon Data Sys. Corp., Travenol Labs	Final and Pending ($525 M Budget)
Navy/Engineering Data Management Information and Control System (EDMICS) Acquisition Project	Award Pending	($8.6 M Budget)
NASA/Johnson Space Center/Technical Management Information System	Boeing	330.7
Army/Project 80X - Phase II	EDS,IBM,ADR	343.0
Treasury/Automated Financial System (AFS)	Advanced Data Management	$50.0
Treasury/Counsel Activity Tracking System (CATS)	Viar	UNK
Air Force/Space Command/System Engineering Support for NORAD Computer System	OAO Corporation	30.0
AFMAC/MAC IPS	Contel, TRW, CSC, GTE Government Systems Corp.	3.6
AF ESD/Command Center Processing and Display Systems (CCPDS)	TRW	59.0
Army FORCECOM	Boeing, IBM, AT&T, Zenith	42.0

C

Systems Integration Opportunities by Agency

Agency	Program	PAR Reference	Estimated Schedule (RFP)	Funding FY 88-92 ($ M)
Air Force	Contracting Data Management System - Phase II (CDMS)	V-1-104	3QFY88	46.5
Air Force	MAC Information Processing System (MAC IPS)	V-1-101	2QFY88	46.3
Air Force	Pipeline Management System II (PMS) Initial Computer Support	V-1-107	2QFY89	9.2
Air Force	Mainframe Computer Capability for the Air Force Institute of Technology		2QFY88	8.4
Air Force	Air Force Equipment Management System (AFEMS)		4QFY88	24.4
Air Force	Computer Replacement of Two Sperry 1100/82s at the Air Force Global Weather Central (AFGWC)		2QFY88	6.2
Air Force	Computer Replacement for the Air Force Accounting and Finance Center		2QFY88	24.5
Air Force	ESD/WWMCC Information System (WIS)	V-1-32	UNK	17.4
Air Force	Computer Replacement/ Enhancement of Computer-Aided Mission Planning System (CAMPS) to Support the Special Operations Forces		2QFY89	6.4
Army	System Support for Integrated Procurement System (IPS)		4QFY88	9.7

Army	ADP Equipment Lease and Systems Development and Maintenance for Headquarters Integrated Office System (HIOS)	V-2-22	1QFY88	5.2
Army	Micro/Mini Computer Purchase and System Support - Commodity Command Standard System (CCSS) Modernization		UNK	83.4
Army	Purchase of Database Machines, ADP Equipment Lease, and System Design and Support for Army Corporate Database	V-2-31	3QFY88	74.4
Army	Purchase of Hardware, Equipment, Maintenance, Software Development/Implementation for Computer-Aided Logistics/Technical Information Management System (CAL/TIMS)		Draft RFP 1QFY88 Final RFP 2QFY88	223.3
Army	System Development and Support for Reserve Component Automation System (RCAS) Mobilization Command and Control System	V-2-34	2QFY88	23.1
Navy	Hardware Procurement and Maintenance for Integrated Disbursing and Accounting Financial Information Processing System (IDAFIPS)		2QFY89	41.9
Navy	Naval Oceanography Data Distribution System (NODDS)		2QFY88	1.2
Navy	Director Naval Laboratories/ Computer for NCSD	V-3-88	1QFY88	5.7
Navy	Consolidated Data Center Replacement ADPE Purchase	V-3-11	3QFY88	58.3

DCAA	Defense Contract Audit Agency/ DCAA Integrated Information System (DIIS)	V-4C-1	3QFY88	16.3
DLA	DLA/DLSC Replacement		2QFY88	28.7
DLA	DLA/Functional Modernization		2QFY88	153.2
Commerce/ National Weather Service	Advanced Weather Interactive Processing System	VI-6-24	2QFY89	143.1
Energy	Network Expansion, Phase II		2QFY88	3.6
Energy	Data Reduction System (Nevada)		2QFY90	2.5
Energy	Administrative Computer Replacement		2QFY89	19.5
Energy	Central Facility Enhancement IV at Y-12		2QFY89	7.7
Energy	DYMCAS Replacement Processor		2QFY90	4.0
Energy	Large-Scale Scientific System No. 2		2QFY90	4.0
Energy	Management System		2QFY88	3.0
Energy	BWIP Integrated Data Management System (IDMS)		2QFY88	2.5
Energy	DISCAS Replacement System		2QFY88	5.3
HHS/ Center for Disease Control	Universal Networking Initiative		2QFY88	3.1
HHS/ Public Health Service	National Center for Health Services Research/Integrated Automated Office System		2QFY88 (Est.)	1.9

HUD	Integrated Information Processing Services (HIIPS)	VII-9B-4	1QFY88	142.0
Interior/ Bureau of Land Management	Automated Land and Mineral Record System	VII-9-11	1QFY99	89.4
Interior/ Bureau of Reclamation	Automated Record Management System (ARMS)	VII-9-14	2QFY88	4.0
Interior/ Minerals Management Service (MMS)	System Redesign for Royalty Management		2QFY88	7.9
Interior/ Office of Surface Mining Reclamation and Enforcement	Coal Data Management Information System	VII-9-12	2QFY90	25.8
Interior/ Office of Surface Mining Reclamation and Enforcement	Applicant Violator System (Phase II & III)	VII-9-13	1QFY89	25.2
Interior/U.S. Geological Survey	Super Computing/Concurrent Processor		2QFY88	1.5
NASA/ Ames Research Center	Numerical Aerodynamic Simulator (NAS) Processing System Network (NPSN) Hi-Speed Processor #3 and #4	VIII-15-60	FY90	80.9

NASA/ Goddard	Customer Data Operations System	VIII-15-62	2QFY88	200 - 400
NASA/ Johnson Space Center	Space Station Support Contractors		1QFY88	237.4
NASA/ Kennedy Space Center	USAF CK CNTL MON. Subsystem (CCMS) II (DoD SEC)		2QFY88	21.0
NASA/ Kennedy Space Center	Network Management System		2QFY88	3.2
Transportation/USCG	Distributed Computing Systems	VII-11-16	UNK	8.5
Transportation/FAA	Computer Resources Nucleus (CORN)	VII-11-28	1QFY88	UNK
Transportation/ Research and Special Programs Admin.	Equipment for FAA's Traffic Management System		2QFY89	7.9
Transportation/Vessel Traffic Service (VTS)	Vessel Traffic Service (VTS) New Orleans Surveillance Project	VII-11-22	2QFY88	74.4
Treasury/ Departmental Offices	Mainframe and Office Automation Replacement		2QFY88	42.9
Treasury/ FMS	Financial Operating System Integrity		2QFY88	34.6

Treasury/ IRS	Automated Criminal Investigation (ACI) Management Information System	VII-12-15	RFC (thru TMAC contract) now available	25.1
Treasury/ IRS	Service Center Cost Accounting/ Integrated Management Systems (IMS)	VII-12-35	4QFY88	10.1
Treasury/ IRS	Integrated Collection System (ICS)	VII-12-33	RFP 2Q88	147.2
Treasury/ IRS	Information Systems Development (ISD)	VII-12-6	3Q89	610.0
Treasury/ IRS	Automation of Criminal Investigation		2QFY88	42.2
Treasury/ IRS	Automated Financial System	VII-12-29	2QFY90	21.1
Treasury/ IRS	Facilities Integrated Management System		2QFY88	8.6
Treasury/ IRS	System for Controlling Assessments		2QFY88	8.3
Treasury/ Bureau of the Public Debt	Data Administration	VII-12-54	UNK	3.33
Treasury/ Bureau of Engraving and Printing	Data Collection and Computer Processing		1QFY89	36.5

D

Turnkey Systems Opportunities By Agency

Agency	Program	PAR Reference	Schedule	Funding FY 88-92 ($ M)
Army	Joint Optical Information Network			50.3
Navy	Prime Turnkey Contract Standard Automated Financial System (STAFS)			29.1
Navy	Computer-Aided Design/ Manufacturing (CAD/CAM) Shipyard Modernization			19.7
Marines	Miniaturization/Automation of Personnel Records			6.9
Agriculture	Integrated Library System		RFP Pending	1.7
Commerce	Integrated Digital Photogrammetric Facility (IDPF)			5.1
Energy	CIM System, Phase V (Los Alamos)			1.42
Energy	CIM System, Phase V (Sandia)			1.8
Energy	CIM System, Phase V (Sandia)			3.6
Energy	CAD/CAM/CIM (Livermore) Phase VI			8.0
Energy	CIM System Replacement, Phase I (Livermore)			1.3
Energy	CIM System, Phase VI (Albuquerque)			3.7

Energy	CIM System Replacement, Phase II (Sandia)		1.3
Energy	CIM System, Phase VII		3.0
Energy	CIM System, Phase VII		3.2
Energy	CIM System Replacement, Phase III		1.3
Energy	CIM System, Phase VIII		2.1
Energy	CIM System, Phase VIII		3.0
Energy	CIM System, Phase IX		2.0
Energy	CIM Automation Phase I, Pinellas Plant		1.8
Energy	Procode Automated Manufacturing System		1.75
Energy	CIM System, Phase IX		3.0
Energy	CAD/CAE/CIM, Phase VIII		6.0
Energy	CIM Production System 6		4.1
Energy	Procode Automated Manufacturing System, Phase II		1.75
Energy	CIM Production System 7		3.5
Energy	CAE System Phase II (Idaho)		4.4
Energy	CAE System Phase IV (Idaho)		2.0
Energy	CAE System Phase V (Idaho)		1.3
Interior	Computer-Aided Drafting Design Systems (CDDS)	2QFY88	15.5

Interior	Image Processing System		2QFY88	.4
NASA	Kennedy Space Center CAD/CAE Development			2.8
NASA	Kennedy Space Center CAD/CAE			3.9
Treasury	Digital Image/Optical Disk Storage System (DI/ODSS)	VII-12-37	2QFY88	102.2

VII

Appendix A: Interview Profiles

A

Federal Agency Respondent Profile

1. Contact Summary

Contacts with agencies were made both by telephone and through on-site visits. On-site interviews were conducted primarily at the department level with officials in the office of Information Resources Management who are responsible for office systems policy and planning.

The distribution of job classifications among individual agency respondents for the 1987 updated analysis is as follows:

	Policy	Buyers	Users	Total
Respondents	11	1	4	16

2. List of Agencies Interviewed

Respondents interviewed in 1985 and 1987 represented the agencies listed below, with the number in parentheses indicating the number of different contacts within the agency.

- Department of Defense
  - Air Force.
  - Army (5).
  - Navy (3).
  - Marine Corps.
  - Defense Logistics Agency.
  - Defense Mapping Agency.

  - Defense Nuclear Agency.
  - Office of the Secretary.

- Civilian Agencies

  - Department of Agriculture (2).
  - Department of Commerce (3).
  - Department of Education.
  - Department of Energy (2).
  - Federal Emergency Management Agency.
  - General Services Administration (2).
  - Government Printing Office.
  - Department of Health and Human Services.
  - Department of Housing and Urban Development.
  - Department of the Interior (2).
  - Department of Justice.
  - National Aeronautics and Space Administration (2).
  - Securities and Exchange Commission.
  - Department of State.
  - Department of Transportation (3).
  - Department of the Treasury (4).
  - Veterans Administration.

B

Vendor Respondent Profile

For the 1987 study, INPUT contacted a representative sample of vendors that provide systems integration and turnkey systems to the federal government.

Job classifications among individual vendor respondents included marketing as well as administrative executives.

Contacts with vendor personnel were made by telephone and by mail.

VII

Appendix B: Definitions

The definitions in this appendix include hardware, software, services, and telecommunications categories to accommodate the range of information systems and services programs described in this report.

Alternate service mode terminology employed by the federal government in its procurement process is defined along with INPUT's regular terms of reference, as shown in Exhibit B-1.

The federal government's unique non-technical terminology that is associated with applications, documentation, budgets, authorization, and the procurement/acquisition process is included in Appendix C, Glossary.

EXHIBIT B-1

FEDERAL INFORMATION SYSTEMS AND SERVICES PROGRAM SYSTEMS AND SERVICES

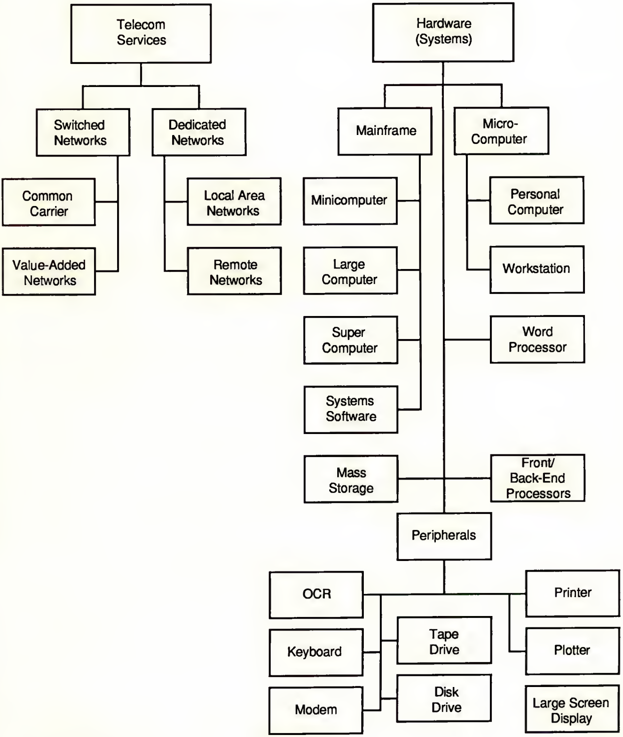


EXHIBIT B-1 (Cont.)

FEDERAL INFORMATION SYSTEMS AND SERVICES PROGRAM SYSTEMS AND SERVICES (Cont.)

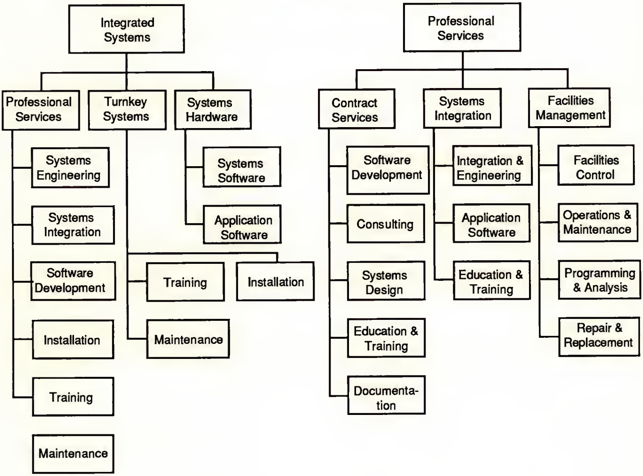
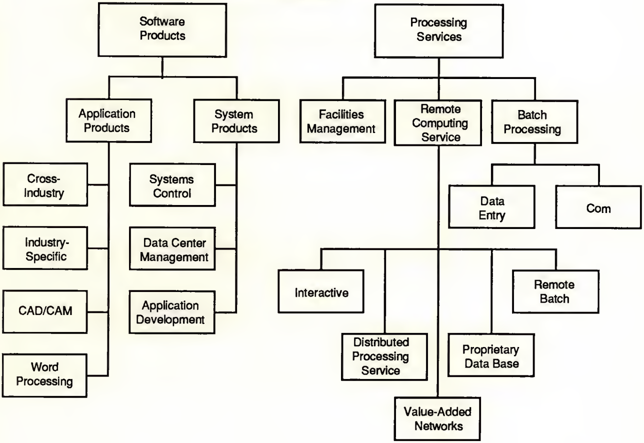


EXHIBIT -1 (Cont.)

FEDERAL INFORMATION SYSTEMS AND SERVICES PROGRAM SYSTEMS AND SERVICES (Cont.)



A Service Modes

1. Processing Services

Processing services include remote computing services, batch services, and processing facilities management.

Remote Computing Services (RCS) - Provision of data processing to a user by means of terminals at the user's site(s). Terminals are connected by a data communications network to the vendor's central computer. The most frequent contract vehicle for RCS in the federal government is GSA's Teleprocessing Services Program (TSP). RCS includes the following submodes.

- *Interactive (timesharing)* - Characterized by the interaction of the user with the system, primarily for problem-solving timesharing but also for data entry and transaction processing; the user is on-line to the program/ files.
- *Remote Batch* - Where the user hands over control of a job to the vendor's computer which schedules job execution according to priorities and resource requirements.
- *Proprietary Data Base* - Characterized by the retrieval and processing of information from a vendor-maintained data base. The data base may be owned by the vendor or by a third party or be licensed by a federal agency.
- *Value-Added Network Services* - Special purpose and/or high-quality network specifically designed to carry digital information, with features not usually provided by the voice-grade, switched public network.
- *Distributed Processing Services* - Alternately called "Distributed Data Processing" (DDP) that can provide:
  - Access through the network to the RCS vendor's larger computers.
  - Local management and storage of a data base subset that will service local terminal users via the connection of a data base processor to the network.
  - Availability of significant software that may be "down loaded" as part of the service.

Batch Processing - These include data processing performed at vendors' sites for user programs and/or data that are physically transported (as opposed to transported electronically by telecommunications media) to

and/or from those sites. Data entry and data output services, such as keypunching and computer output microfilm processing, are also included. Batch services include expenditures by users who take their data to a vendor site that has a terminal connected to a remote computer for the actual processing.

Processing Facilities Management (PFM) - Also referred to as "Resource Management," "Systems Management," or "COCO" (Contractor-Owned, Contractor-Operated). The management of all or part of a user's data processing functions under a long-term contract of not less than one year. This would include remote computing and batch services. To qualify as PFM, the contractor must directly plan, control, operate, and own or lease the facility provided to the user, either on-site, through communications lines, or in a mixed mode.

2. Professional Services

Professional services provide labor-intensive consulting, design, education and training, programming and analysis, management, and systems integrations as defined within these general categories.

- *Contract Services* - Provision of professional and technical services of various skill levels to accomplish specific tasks not specifically or necessarily associated with a delivered product, other than paper or ADP media records. Contracts generally require vendor management of staff and/or resources.

- *Consulting* - Information systems and/or services management consulting, program assistance (technical and/or management), feasibility analyses, and cost-effectiveness trade-off studies.

- *Education and Training* - Products and/or services related to information systems and services for the user, including computer-aided instruction (CAI), computer-based education (CBE), and vendor instruction of user personnel in management operations, programming, and maintenance of systems.

- *Systems Design* - Preparation of systems/sub-systems architecture, specifications, and performance criteria from functional information processing statements or performance of an operations requirements study. May include ADP, telecommunications, site layout, training, and maintenance facilities.

- *Software Development* - Also known as programming and analysis services, this includes applications and systems software design, contract or custom programming, code conversion, independent verification and validation (IV&V), and benchmarking. These services may also include follow-on software development and maintenance.

- *Documentation Services* - Vendor preparation, modification, or replacement of system operating manuals, software coding records, training manuals, software library records, and equipment modification records.

Professional Services Facilities Management (PSFM) - Also referred to as GOCO (Government-Owned, Contractor-Operated) services. The computing equipment is owned or leased by the client (government), not by the vendor. The vendor provides the staff to operate, maintain, repair, schedule, and manage the client's facility over a term of three to five years. Submodes include:

- *Facilities Control* - Vendor management, including scheduling of resources and personnel, to meet specified operations objectives or produce specified information products, with no direct client supervision.

- *Operation and Maintenance (O&M)* - Vendor operation and maintenance of government-owned ADP/telecommunications equipment in a government-owned/leased facility (on-site) without vendor management of the facility.

- *Programming and Analysis (Support)* - Vendor-furnished professional and technical staff support, which may be provided on or off the client's site, to analyze information processing requirements, plan resource applications, and/or develop/modify/maintain custom software, over a period of time not less than one year. Contracts tend to be task-oriented to control the work flow.

- *Hardware and/or Software Maintenance* - Vendor-furnished services provided after installation and acceptance by the government, where the vendor may not be the original supplier (third-party maintenance or TPM) and may use either on-site or on-call personnel to perform services.

- *Repair and Replacement* - Vendor-furnished services and acquires information system components to repair or replace worn or defective equipment and to add equipment needed to meet new or unusual requirements.

Systems Integration - Services associated with design and integration, software development, and installation and government acceptance of ADP/telecommunications systems. Services may also include related engineering activities such as Systems Engineering and Integration (SE&I) or Systems Engineering and Technical Assistance (SETA).

- *Engineering and Integration* - Vendor-furnished technical services provided separately from acquisition of hardware and software to expand the initial design into specifications, interface descriptions, installation, and operating instructions of the complete system.

- *Applications Software* - Custom software development to satisfy non-commercially available information processing requirements of an integrated system.

- *Education and Training* - Vendor development of training aids, manuals, and curricula for indoctrinating client management, operation and maintenance, and information product user personnel on the newly integrated information system.

3. Turnkey Systems

Turnkey systems, also known as integrated systems, include systems and applications software packaged with hardware as a single entity. Most CAD/CAM systems and many small business systems are integrated systems. This mode does not include specialized hardware systems such as word processors, cash registers, and process control systems.

4. Software Products

Software products include user purchases of applications and systems packages for in-house computer systems. Included are lease and purchase expenditures, as well as expenditures for work performed by the vendor to implement and maintain the package at the user's sites. Expenditures for work performed by organizations other than the package vendor are counted in the category of professional services. There are several subcategories of software products, as indicated below and shown in detail in Exhibit B-2.

Application Products - Software that performs processing which services user functions. The products can be:

- *Cross-Industry Products* - Used in multiple industry applications as well as in federal government sectors. Examples are payroll, inventory control, and financial planning.

- *Industry-Specialized Products* - Used in a specific federal government sector, such as planning, resource utilization, aircraft flight planning, military personnel training, and others. May also include some products designed to work in an industry other than the federal government but applicable to specific government-performed commercial/industrial services, such as hospital information, vehicular fleet scheduling, electrical power generation and distribution, CAD/CAM, and others.

Systems Products - Software that enables the computer/communications systems to perform basic functions. These products include:

- *System Control Products* - Function during applications program execution to manage the computer system resources. Examples include operating systems, communication monitors, emulators, and spoolers.

- *Data Center Management Products* - Used by operations personnel to manage the computer systems resources and personnel more effectively. Examples include performance measurement, job accounting, computer operations scheduling, and utilities.

- *Applications Development Products* - Used to prepare applications for execution by assisting in designing, programming, testing, and related functions. Examples include languages, sorts, productivity aids, compilers, data dictionaries, data base management systems, report writers, project control systems, and retrieval systems.

5. Hardware and Hardware Systems

Hardware included all ADP and telecommunications equipment that can be separately acquired by the government with or without installation by the vendor and not acquired as part of an integrated system. For the purpose of this report, hardware is grouped in three major categories: peripherals, terminals, and hardware systems (processors).

Peripherals - Include all input, output, communications, and storage devices other than main memory that can be connected locally to the main processor and generally cannot be included in other categories such as terminals.

- *Input Devices* - Includes keyboards, numeric pads, card readers, light pens and track balls, tape readers, position and motion sensors, and analog-to-digital converters.

- *Output Devices* - Includes printers, CRTs, projection television screens, micrographics processors, digital graphics, and plotters.

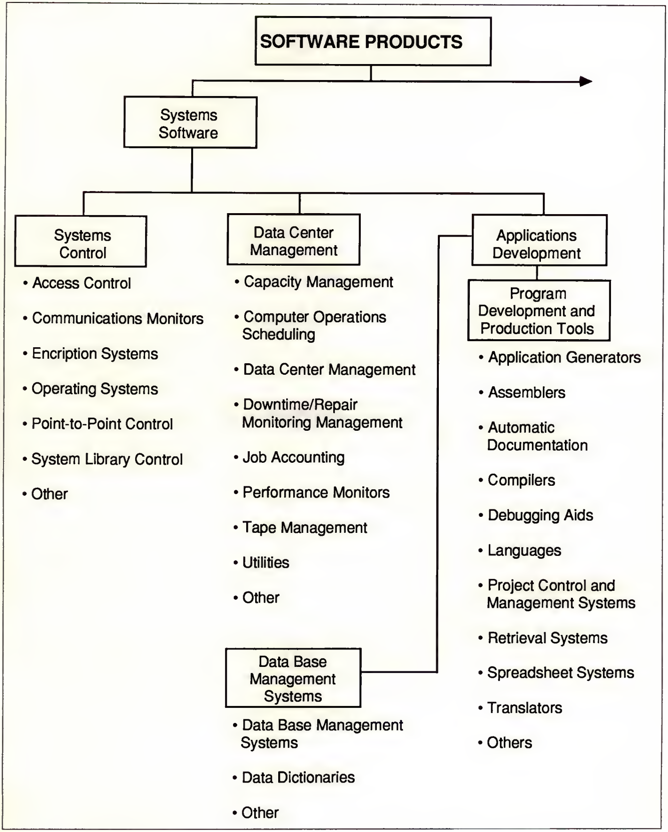
- *Communication Devices* - Modems, encryption equipment, special interfaces, and error control.

- *Storage Devices* - Includes magnetic tape (reel, cartridge, and cassette), floppy and hard disks, drums, solid state (integrated circuits), and bubble and optical memories.

Terminals - Federal government systems use three types of terminals as described below.

- *User-Programmable* - Also called intelligent terminals, including:
  - Single-station or standalone.
  - Multi-station shared processor.
  - Teleprinter.
  - Remote batch.

EXHIBIT B-2



SOFTWARE PRODUCTS

Systems Software

Systems Control

- Access Control
- Communications Monitors
- Encription Systems
- Operating Systems
- Point-to-Point Control
- System Library Control
- Other

Data Center Management

- Capacity Management
- Computer Operations Scheduling
- Data Center Management
- Downtime/Repair Monitoring Management
- Job Accounting
- Performance Monitors
- Tape Management
- Utilities
- Other

Data Base Management Systems

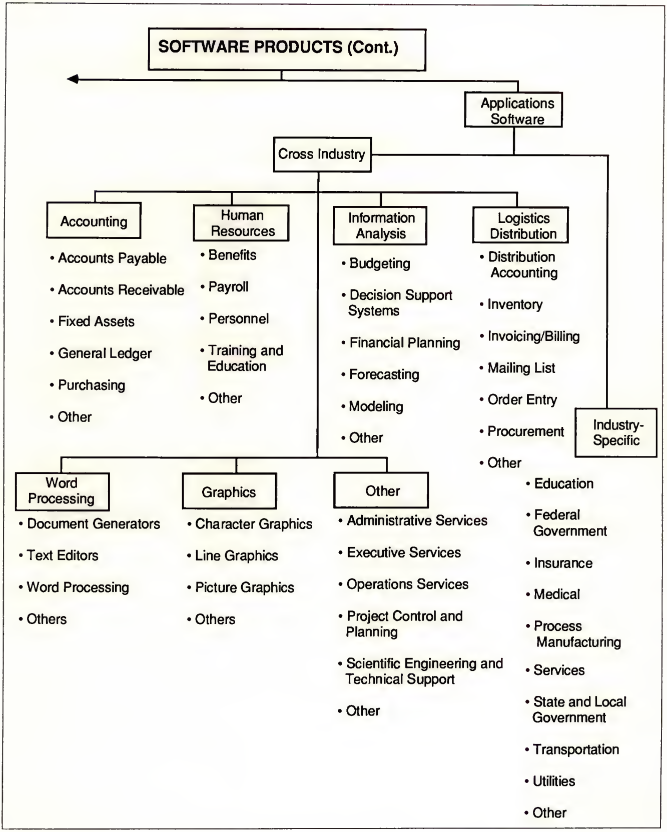
- Data Base Management Systems
- Data Dictionaries
- Other

Applications Development

Program Development and Production Tools

- Application Generators
- Assemblers
- Automatic Documentation
- Compilers
- Debugging Aids
- Languages
- Project Control and Management Systems
- Retrieval Systems
- Spreadsheet Systems
- Translators
- Others

EXHIBIT B-2 (Cont.)



- *Non-Programmable* - Also called "dumb" terminals, including:
    - Single-station.
    - Multi-station shared processor.
    - Teleprinter.

- *Limited Function* - Originally developed for specific needs, such as point-of-sale (POS), inventory data collections, controlled access, and other applications.

Hardware Systems - Includes all processors from microcomputers to supercomputers. Hardware systems may require type- or model-unique operating software to be functional, but this category excludes applications software and peripheral devices, other than main memory and processors or CPUs not provided as part of an integrated (turnkey) system.

- *Microcomputer* - Combines all of the CPU, memory, and peripheral functions of an 8-, 16-, or 32-bit computer on a chip in the form of:

    - Integrated circuit package.

    - Plug-in boards with more memory and peripheral circuits.

    - Console including keyboard and interfacing connectors.

    - Personal computer with at least one external storage device directly addressable by the CPU.

    - An embedded computer which may take a number of shapes or configurations.

- *Minicomputer* - Usually a 12-, 16-, or 32-bit computer which may be provided with limited applications software and support and may represent a portion of a complete large system.

    - Personal business computer.
    - Small laboratory computer.
    - Nodal computer in a distributed data network, remote data collection network, or connected to remote microcomputers.

- *Midicomputer* - Typically a 32- or 64-bit computer with extensive applications software and a number of peripherals in standalone or multiple-CPU configurations for business (administrative, personnel, and logistics) applications; also called a general purpose computer.

- *Large Computer* - Presently centered around storage controllers but likely to become bus-oriented and to consist of multiple processors or

parallel processors. Intended for structured mathematical and signal processing and typically used with general purpose, VonNeumann-type processors for system control.

- *Supercomputer* - High-powered processors with numerical processing throughput that is significantly greater than the fastest general purpose computers, with capacities in the 10-50 million floating point operations per second (MFLOPS) range. Newer supercompu-ters, with burst modes approaching 300 MFLOPS, main storage size up to 10 million words, and on-line storage in the one-to-three gigabyte class, are labeled Class IV to Class VII in agency long-range plans. Supercomputers fit in one of two categories:
  - *Real Time* - Generally used for signal processing in military applications.
  - *Non-Real Time* - For scientific use in one of three configurations:
    - Parallel processors.
    - Pipeline processor.
    - Vector processor.
  - *Super( )computer* - Term applied to micro, mini, and large mainframe computers with performance substantially higher than attainable by VonNeuman architectures.
- *Embedded Computer* - Dedicated computer system designed and implemented as an integral part of a weapon, weapon system, or platform; critical to a military or intelligence mission such as command and control, cryptological activities, or intelligence activities. Characterized by military specifications (MIL SPEC) appearance and operation, limited but reprogrammable applications software, and permanent or semi-permanent interfaces. May vary in capacity from microcomputers to parallel processors computer systems.

6. Telecommunications

Networks - Electronic interconnections between sites or locations which may incorporate links between central computer sites and remote locations and switching and/or regional data processing nodes. Network services typically are provided on a leased basis by a vendor to move data, voice, video, or textual information between locations. Networks can be categorized in several different ways.

- *Common Carrier Network* - A public access network, such as provided by AT&T, consisting of conventional voice-grade circuits and regular switching facilities accessed through dial-up calling with leased or user-owned modems for transfer rates between 150 and 1,200 baud.

- *Value-Added Network (VAN)* - Provided by vendors through common carrier or special-purpose transmission facilities with special features not available in the voice-grade switched public network. These include:
  - *Dedicated Network* - Also known as a private network, established and operated for one user or user organization using dedicated circuits to establish permanent connections between two or more stations.
  - *Packet Switching* - Real time network routing, transmitting, and receiving data in the form of addressed packets, each of which may be part of a message or include several messages without exclusive use of a network circuit by the transmitting and receiving stations.
  - *Message Switching* - Non-real time process for routing messages through network where a user message is received, stored, and forwarded from switch to switch through the network without an end-to-end circuit between sending and receiving stations; used primarily for data.
- *Local Area Network (LAN)* - Limited-access network between computing resources in a relatively small (but not necessarily contiguous) area, such as a building, complex of buildings, or buildings distributed within a metropolitan area. Uses one of two signalling methods.
  - *Baseband* - Signaling using digital waveforms on a single frequency band, usually at voice frequencies, and bandwidth, limited to a single sender at any given moment. When used for local area networks, typically implemented with TDM to permit multiple access.
  - *Broadband* - Transmission facilities that use frequencies greater than normal voice-grade, supported in local area networks with RF modems and AC signaling. Also known as wideband. Employs multiplexing techniques that increase carrier frequency between terminals to provide:
    - Multiple channels through FDM or TDM.
    - High-speed data transfer via parallel mode at rates of up to 96,000 baud.

Transmission Facilities - Includes wire, carrier, coaxial cable, microwave, optical fiber, satellites, cellular radio, and marine cable operating in one of two modes depending on the vendor and the distribution of the network.

- *Mode* - may be either:
  - *Analog* - Transmission or signal with continuous waveform representation, typified by AT&T's predominantly voice-grade DDD network and most telephone operating company distribution systems.
  - *Digital* - Transmission or signal using discontinuous, discrete quantities to represent data, which may be voice, data, record, video, or text, in binary form.
- *Media* - May be any of the following:
  - *Wire* - Varies from earlier single-line teletype networks, to two-wire standard telephone (twisted pair), to four-wire full-duplex balanced lines.
  - *Carrier* - A wave, pulse train, or other signal suitable for modulation by an information-bearing signal to be transmitted over a communications system, used in multiplexing applications to increase network capacity.
  - *Coaxial Cable* - A cable consisting of an insulated central conductor surrounded by a cylindrical conductor with additional insulation on the outside and covered with an outer sheath used in HF (high frequency) and VHF (very high frequency), single frequency, or carrier-based systems; requires frequent reamplification (repeaters) to carry the signal any distance.
  - *Microwave* - UHF (ultra-high frequency) multi-channel, point-to-point, repeated radio transmission, also capable of wide frequency channels.
  - *Optical Fiber* - Local signal distribution systems employed in limited areas, using light-transmitting glass fibers and TDM for multi-channel applications.
  - *Communications Satellites* - Synchronous earth-orbiting systems that provide point-to-point, two-way service over significant distances without intermediate amplification (repeaters), but requiring suitable groundstation facilities for up- and down-link operation.
  - *Cellular Radio* - Network of fixed, low-powered two-way radios that are linked by a computer system to track mobile phone-data set units. Each radio serves a small area called a cell. The computer switches service connection to the mobile unit from cell to cell.

B

General Definitions

103/113 - Bell standard modem for low-speed transmission up to 300 bps, asynchronous, half or full duplex.

212 - Bell standard for medium-speed transmission at 1200 bps, asynchronous or synchronous, half or full duplex.

ASCII - American National Standard Code for Information Interchang—eight-bit code with seven data bits and one parity bit.

Asynchronous - Communications operation (such as transmission) without continuous timing signals. Synchronization is accomplished by appending signal elements to the data.

Bandwidth - Range of transmission frequencies that can be carried on a communications path; used as a measure of capacity.

Baud - Number of signal events (discrete conditions) per second. Typically used to measure modem or terminal transmission speed.

Benchmark - Method of testing proposed ADP system solutions for a specified set of functions (applications) employing simulated or real data inputs under simulated operating conditions.

BPS - Bits per second - also mbps and kbps, million bits per second and thousand bits per second, respectively.

BSC - IBM's binary synchronous communications data link protocol. First introduced in 1968 for use on point-to-point and multipoint communications channels. Frequently referenced as "bisync."

Byte - Usually equivalent to the storage required for one alphanumeric character (i.e., one letter or number).

CBX - Computerized Branch Exchange - a PABX based on a computer system, implying programmability and usually voice and data capabilities.

Central Processing Unit (CPU) - The arithmetic and control portion of a computer; i.e., the circuits controlling the interpretation and execution of computer instructions.

Centrex - Central office telephone services that permit local circuit switching without installation of customer premises equipment. Could be described as shared PBX service.

Circuit Switching - A process that, usually on demand, connects two or more network stations and permits exclusive circuit use until the connec-

tion is released; typical of the voice telephone network where a circuit is established between the caller and the called party.

CO - Central Office - local telco site for one or more exchanges.

CODEC - Coder/decoder, equivalent to modem for digital devices.

Constant Dollars - Growth forecasts in constant dollars make no allowance for inflation or recession. Dollar value based on the year of the forecast unless otherwise indicated.

Computer System - The combination of computing resources required to perform the designed functions and which may include one or more CPUs, machine room peripherals, storage systems, and/or applications software.

CPE - Customer Premises Equipment - DCE or DTE located at a customer site rather than at a carrier site such as the local telephone company CO. May include switchboards, PBX, data terminals, and telephone answering devices.

CSMA/CD - Carrier Sense Multiple Access/Collision Detect. Contention protocol used in local-area networks, typically with a multi-point configuration.

Current Dollars - Estimates or values expressed in current-year dollars which, for forecasts, would include an allowance for inflation.

Data Encryption Standard (DES) - 56-bit key, one-way encryption algorithm adopted by NBS in 1977, implemented through hardware ("S-boxes") or software. Designed by IBM with NSA guidance.

Datagram - A self-contained packet of information with a finite length that does not depend on the contents of preceding or following packets.

DCA - IBM's Document Content Architecture - protocols for specifying document (text) format which are consistent across a variety of hardware and software systems within IBM's DISOSS.

DCE - Data Circuit-terminating Equipment - interface hardware that couples DTE to a transmission circuit or channel by providing functions to establish, maintain, and terminate a connection, including signal conversion and coding.

DDCMP - Digital Data Communications Message Protocol - data link protocol used in Digital Equipment Company's DECNET.

DECNET - Digital Equipment Company's network architecture.

Dedicated Circuit - A permanently established network connection between two or more stations; contrast with switched circuit.

DEMS - Digital Electronic Message Service - nationwide common carrier digital networks which provide high-speed, end-to-end, two-way transmission of digitally-encoded information using the 10.6 GHz band.

DIA - IBM's Document Interchange Architecture - protocols for transfer of documents (text) between different hardware and software systems within IBM's DISOSS.

DISOSS - IBM's DIStributed Office Support System - office automation environment, based on DCA and DIA, which permits document (text) transfer between different hardware and software systems without requiring subsequent format or content revision.

Distributed Data Processing - The development of programmable intelligence in order to perform a data processing function where it can be accomplished most effectively through computers and terminals arranged in a telecommunications network adapted to the user's characteristics.

DTE - Data Terminal Equipment - hardware which is a data source or sink or both, such as video display terminals that convert user information into data for transmission and reconvert data signals into user information.

EBCDIC - Extended Binary Coded Decimal Interchange Code - eight-bit code typically used in IBM mainframe environments.

EFT - Electronic funds transfer.

Encryption - Electrical, code-based conversion of transmitted data to provide security and/or privacy of data between authorized access points.

End User - One who is using a product or service to accomplish his or her own functions. The end user may buy a system from the hardware supplier(s) and do his or her own programming, interfacing, and installation. Alternately, the end user may buy a turnkey system from a systems house or hardware integrator, or may buy a service from an in-house department or external vendor.

Engineering Change Notice (ECN) - Product changes to improve the product after it has been released to production.

Engineering Change Order (ECO) - The follow-up to ECNs - they include parts and a bill of materials to effect the change in the hardware.

Equipment Operators - Individuals operating computer control consoles and/or peripheral equipment (BLS definition).

Ethernet - Local area network developed by Xerox PARC using baseband signaling, CSMA/CD protocol, and coaxial cable to achieve a 10 mbps data rate.

Facsimile - Transmission and reception of data in graphic form, usually fixed images of documents, through scanning and conversion of a picture signal.

FDM - Frequency Division Multiplexing - a multiplexing method that permits multiple access by assigning different frequencies of the available bandwidth to different channels.

FEP - Front-End Processor - communications concentrator such as the IBM 3725 or COMTEN 3690 used to interface communications lines to host computers.

Field Engineer (FE) - Field engineer, customer engineer, serviceperson, and maintenance person are used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

Full-Duplex - Bi-directional communications with simultaneous two-way transmission.

General Purpose Computer System - A computer designed to handle a wide variety of problems. Includes machine room peripherals, systems software, and small business systems.

Half-Duplex - Bi-directional communications, but only in one direction at a time.

Hardware Integrator - Develops system interface electronics and controllers for the CPU, sensors, peripherals, and all other ancillary hardware components. The hardware integrator also may develop control system software in addition to installing the entire system at the end-user site.

HDLC - High-level Data Link Control.

Hertz - Number of signal oscillations (cycles) per second - abbreviated Hz.

IBM Token Ring - IBM's local area network using baseband signalling and operating at 4 mbps on twisted-pair copper wire. Actually a combination of star and ring topologies – IEEE 802.5-compatible.

IDN - Integrated Digital Network - digital switching and transmission; part of the evolution to ISDN.

Independent Suppliers - Suppliers of machine room peripherals - usually do not supply general purpose computer systems.

Information Processing - Data processing as a whole, including use of business and scientific computers.

Installed Base - Cumulative number or value (cost when new) of computers in use.

Interconnection - Physical linkage between devices on a network.

Interoperability - The capability to operate with other devices on a network. To be contrasted with interconnection, which merely guarantees a physical network interface.

ISDN - Integrated Services Digital Network - integrated voice and non-voice public network service which is completely digital. Not clearly defined through any existing standards although FCC and other federal agencies are participating in the development of CCITT recommendations.

Keypunch Operators - Individuals operating keypunch machines (similar in operation to electric typewriters) to transcribe data from source materials onto punch cards.

Lease Line - Permanent connection between two network stations. Also known as dedicated or non-switched line.

Machine Repairers - Individuals who install and periodically service computer systems.

Machine Room Peripherals - Peripheral equipment that is generally located close to the central processing unit.

Mainframe - The central processing unit (CPU or units in a parallel processor) of a computer that interprets and executes computer (software) instructions of 32 bits or more.

MAP - Manufacturing Automation Protocol - seven-layer communications standard for factory environments promoted by General Motors/ EDS. Adopts IEEE 802.2 and IEEE 802.4 standards plus OSI protocols for other layers of the architecture.

Mean Time to Repair - The mean of elapsed times from the arrival of the field engineer on the user's site until the device is repaired and returned to user service.

Mean Time to Respond - The mean of elapsed times from the user call for services and the arrival of the field engineer on the user's site.

Message - A communication intended to be read by a person. The quality of the received document need not be high, only readable. Graphic materials are not included.

MMFS - Manufacturing Messaging Format Standard - application-level protocol included within MAP.

Modem - A device that encodes information into electronically transmittable from (MOdulator) and restores it to original analog form (DEModulator).

NCP - Network Control Program - software used in IBM 3705/3725 FEPs for control of SNA networks.

Node - Connection point of three or more independent transmission points which may provide switching or data collection.

Off-Line - Pertaining to equipment or devices that can function without direct control of the central processing unit.

On-Line - Pertaining to equipment or devices under direct control of the central processing unit.

OSI - ISO reference model for Open Systems Interconnection - seven-layer architecture for application, presentation, session, transport, network, data link, and physical services and equipment.

OSI Application Layer - Layer 7, providing end-user applications services for data processing.

OSI Data Link Layer - Layer 2, providing transmission protocols, including frame management, link flow control, and link initiation/release.

OSI Network Layer - Layer 3, providing call establishment and clearing control through the network nodes.

OSI Physical Layer - Layer 1, providing the mechanical, electrical, functional, and procedural characteristics to establish, maintain, and release physical connections to the network.

OSI Presentation Layer - Layer 6, providing data formats and information such as data translation, data encoding/decoding, and command translation.

OSI Session Layer - Layer 5, establishes, maintains, and terminates logical connections for the transfer of data between processes.

OSI Transport Layer - Layer 4, providing end-to-end terminal control signals such as acknowledgements.

Overseas - Not within the geographical limits of the continental United States, Alaska, Hawaii, and U.S. possessions.

PABX - Private Automated Branch Exchange - hardware that provides automatic (electro-mechanical or electronic) local circuit switching on a customer's premises.

PAD - Packet Assembler-Disassembler - a device that enables DTE not equipped for packet switching operation to operate on a packet switched network.

PBX - Private Branch Exchange - hardware which provides local circuit switching on the customer premise.

PCM - Pulse-Code Modulation - modulation involving conversion of a waveform from analog to digital form through coding.

PDN - Public Data Network - a network established and operated by a recognized private operating agency, a telecommunications administration, or other agency for the specific purpose of providing data transmission services to the public.

Peripherals - Any unit of input/output equipment in a computer system, exclusive of the central processing unit.

PPM - Pulse Position Modulation.

Private Network - A network established and operated for one user or user organization.

Programmers - Persons mainly involved in designing, writing, and testing of computer software programs.

Protocols - The rules for communication system operation that must be followed if communication is to be effected. Protocols may govern portions of a network or service. In digital networks, protocols are digitally encoded as instructions to computerized equipment.

Public Network - A network established and operated for more than one user with shared access, usually available on a subscription basis. See related international definition of PDN.

Scientific Computer System - A computer system designed to process structured mathematics, such as Fast Fourier Transforms, and complex, highly redundant information, such as seismic data, sonar data, and radar, with large on-line memories and very high capacity throughput.

SDLC - Synchronous Data Link Control - IBM's data link control for SNA. Supports a subset of HDLC modes.

SDN - Software-Defined Network.

Security - Physical, electrical, and computer (digital) coding procedures to protect the contents of computer files and data transmission from inadvertent or unauthorized disclosure to meet the requirements of the Privacy Act and national classified information regulations.

Service Delivery Point - The location of the physical interface between a network and customer/user equipment.

Simplex - Undirectional communications.

Smart Box - A device for adapting existing DTE to new network standards such as OSI. Includes PADs and protocol convertors, for example.

SNA - Systems Network Architecture-seven-layer communications architecture designed by IBM. Layers correspond roughly but not exactly to OSI model.

Software - Computer programs.

Supplies - Includes materials associated with the use or operations of computer systems, such as printer paper, keypunch cards, disk packs, and tapes.

Switched Circuit - Temporary connection between two network stations established through dial-up procedures.

Synchronous - Communications operation with separate, continuous clocking at both sending and receiving stations.

Systems Analyst - Individual who analyzes problems to be converted to a programmable form for application to computer systems.

Systems House - Vendor that acquires, assembles, and integrates hardware and software into a total turnkey system to satisfy the data processing requirements of an end user. The vendor also may develop systems software products for license to end users. The systems house vendor does not manufacture mainframes.

Systems Integrator - Systems house vendor that develops systems interface electronics, applications software, and controllers for the CPU, peripherals, and ancillary subsystems that may have been provided by a contractor or the government (GFE). This vendor may either supervise or perform the installation and testing of the completed system.

TI - Bell System designation for 1.544 mbps carrier capable of handling 24 PCM voice channels.

TDM - Time Division Multiplexing - a multiplexing method that interleaves multiple transmissions on a single circuit by assigning a different time slot to each channel.

Token Passing - Local area network protocol which allows a station to transmit only when it has the "token," an empty slot on the carrier.

TOP - Technical Office Protocol - protocol developed by Boeing Computer Services to support administrative and office operations as complementary functions to factory automation implemented under MAP.

Turnkey System - System composed of hardware and software integrated into a total system designed to completely fulfill the processing requirements of a single application.

Twisted-Pair Cable - Communications cabling consisting of pairs of single-strand metallic electrical conductors, such as copper wires, typically used in building telephone wiring and some LANs.

Verification and Validation - Process for examining and testing applications and special systems software to verify that it operates on the target CPU and performs all of the functions specified by the user.

Voice-Grade - Circuit or signal in the 300-3300 Hz bandwidth typical of the public telephone system - nominally a 4 KHz user.

VTAM - Virtual Telecommunications Access Method - host-resident communications software for SNA networks.

C

Other Considerations

When questions arise as to the proper place to count certain user expenditures, INPUT addresses the questions from the user viewpoint. Expenditures then are categorized according to what the users perceive they are buying.

VII

Appendix C: Glossary of Acronyms

The federal government's procurement language uses a combination of acronyms, phrases, and works that is complicated by different agency definitions and interpretations. The government also uses terms of accounting, business, economics, engineering, and law with new applications and technology.

Acronyms and contract terms that INPUT encountered most often in program documentation and interviews for this report are included here, but this glossary should not be considered all-inclusive. Federal procurement regulations (DAR, FPR, FAR, FIRMR, FPMR) and contract terms listed in RFIs, RFPs, and RFQs provide applicable terms and definitions.

Federal agency acronyms have been included to the extent they are employed in this report.

A

Federal Acronyms

AAS	Automatic Addressing System.
AATMS	Advanced Air Traffic Management System.
ACO	Administrative Contracting Offices (DCAS).
ACS	Advanced Communications Satellite (formerly NASA 30/20 GHz Satellite Program).
ACT-1	Advanced Computer Techniques (Air Force).
Ada	DoD High-Order Language.
ADA	Airborne Data Acquisition.
ADL	Authorized Data List.
ADS	Automatic Digital Switches (DCS).
AFA	Air Force Association.
AFCEA	Armed Forces Communications Electronics Association.
AGE	Aerospace Ground Equipment.
AIP	Array Information Processing.
AMPE	Automated Message Processing Equipment.
AMPS	Automated Message Processing System.

AMSL	Acquisition Management Systems List.
AP(P)	Advance Procurement Plan.
Appropriation	Congressionally approved funding for authorized programs and activities of the Executive Branch.
APR	Agency Procurement Request.
ARPANET	DARPA network of scientific computers.
ATLAS	Abbreviated Test Language for All Systems (for ATE-Automated Test Equipment).
Authorization	In the legislative process programs, staffing, and other routine activities must be approved by Oversight Committees before the Appropriations Committee will approve the money from the budget.
AUSA	Association of the U.S. Army.
AUTODIN	AUTOmatic DIgital Network of the Defense Communications System.
BA	Basic Agreement.
BAFO	Best And Final Offer.
Base level	Procurement, purchasing, and contracting at the military installation level.
BCA	Board of Contract Appeals.
Benchmark	Method of evaluating ability of a candidate computer system to meet user requirements.
Bid protest	Objection (in writing, before or after contract award) to some aspect of a solicitation by a valid bidder.
BML	Bidders Mailing List – qualified vendor information filed annually with federal agencies to automatically receive RFPs and RFQs in areas of claimed competence.
BOA	Basic Ordering Agreement.
B&P	Bid and Proposal – vendor activities in response to government solicitation/specific overhead allowance.
BPA	Blanked Purchase Agreement.
Budget	Federal Budget, proposed by the President and subject to Congressional review.
C2	Command and Control.
C3	Command, Control, and Communications.
C4	Command, Control, Communications, and Computers.
C3I	Command, Control, Communications, and Intelligence.
CAB	Contract Adjustment Board or Contract Appeals Board.

CADE	Computer-Aided Design and Engineering.
CADS	Computer-Assisted Display Systems.
CAIS	Computer-Assisted Instruction System.
CAPS	Command Automation Procurement Systems.
CAS	Contract Administration Services or Cost Accounting Standards.
CASB	Cost Accounting Standards Board.
CASP	Computer-Assisted Search Planning.
CBD	Commerce Business Daily – U.S. Department of Commerce publication listing government contract opportunities and awards.
CBO	Congressional Budget Office.
CCDR	Contractor Cost Data Reporting.
CCN	Contract Change Notice.
CCPDS	Command Center Processing and Display Systems.
CCPO	Central Civilian Personnel Office.
CCTC	Command and Control Technical Center (JCS).
CDR	Critical Design Review.
CDRL	Contractor Data Requirements List.
CFE	Contractor-Furnished Equipment.
CFR	Code of Federal Regulations.
CIG	Computerized Interactive Graphics.
CIR	Cost Information Reports.
CM	Configuration Management.
CMI	Computer-Managed Instruction.
CNI	Communications, Navigation, and Identification.
CO	Contracting Office, Contract Offices, or Change Order.
COC	Certificate of Competency (administered by the Small Business Administration)
COCO	Contractor-Owned, Contractor-Operated.
CODSIA	Council of Defense and Space Industry Associations.
COMSTAT	Communications Satellite Corporation.
CONUS	CONtinental United States.
COP	Capability Objective Package.
COTR	Contracting Officer's Technical Representative.
CP	Communications Processor.
CPAF	Cost-Plus-Award-Fee Contract.
CPFF	Cost-Plus-Fixed-Fee Contract.
CPIF	Cost-Plus-Incentive-Fee Contract.
CPR	Cost Performance Reports.
CPSR	Contractor Procurement Systems Architecture.
CR	Cost Reimbursement (Cost Plus Contract).
CSA	Combat or Computer Systems Architecture.
C/SCSC	Cost/Schedule Control System Criteria (also called "C-Spec").
CWAS	Contractor Weighted Average Share in Cost Risk.

DAL	Data Accession List.
DAR	Defense Acquisition Regulations.
DARPA	Defense Advanced Research Projects Agency.
DAS	Data Acquisition System.
DBHS	Data Base Handling System.
DCA	Defense Communications Agency.
DCAA	Defense Contract Audit Agency.
DCAS	Defense Contract Administration Services.
DCASR	DCAS Region.
DCC	Digital Control Computer.
DCP	Development Concept Paper (DoD).
DCS	Defense Communications System.
DCTN	Defense Commercial Telecommunications Network.
DDA	Dynamic Demand Assessment (Delta Modulation).
DDC	Defense Documentation Center.
DDL	Digital Data Link – A segment of a communications network used for approval of a negotiated procurement.
DDN	Defense Data Network.
DDS	Dynamic Diagnostics System.
DES	Data Encryption Standard.
D&F	Determination and Findings – Required documentation for approval of a negotiated procurement.
DIA	Defense Intelligence Agency.
DIF	Document Interchange Format, Navy-sponsored word processing standard.
DHHS	Department of Health and Human Services.
DIDS	Defense Integrated Data Systems.
DISC	Defense Industrial Supply Center.
DLA	Defense Logistics Agency.
DMA	Defense Mapping Agency.
DNA	Defense Nuclear Agency.
DO	Delivery Order.
DOA	Department of Agriculture (also USDA).
DOC	Department of Commerce.
DOE	Department of Energy.
DOI	Department of Interior.
DOJ	Department of Justice.
DOS	Department of State.
DOT	Department of Transportation.
DPA	Delegation of Procurement Authority (granted by GSA under FPRs).
DPC	Defense Procurement Circular.
DQ	Definite Quantity Contract.
DQ/PL	Definite Quantity Price List Contract.
DR	Deficiency Report.
DSN	Defense Switched Network.
DSP	Defense Support Program (WWMCCS).

DSS	Defense Supply Service.
DTC	Design-To-Cost.
ECP	Engineering Change Proposal.
ED	Department of Education.
EEO	Equal Employment Opportunity.
8(a) Set-Aside	Agency awards directly to Small Business Administration for direct placement with a socially/economically disadvantaged company.
EMC	Electro-Magnetic Compatibility.
EMCS	Energy Monitoring and Control System.
EO	Executive Order – Order issued by the President.
EOQ	Economic Ordering quantity.
EPA	Economic Price Adjustment.
EPA	Environmental Protection Agency.
EPMR	Estimated Peak Monthly Requirement.
EPS	Emergency Procurement Service (GSA) or Emergency Power System.
EUC	End-User Computing, especially in DoD.
FA	Formal Advertising.
FAC	Facility Contract.
FAR	Federal Acquisition Regulations.
FCA	Functional Configuration Audit.
FCC	Federal Communications Commission.
FCDC	Federal Contract Data Center.
FCRC	Federal Contract Research Center.
FDPC	Federal Data Processing Center.
FEDSIM	Federal (Computer) Simulation Center (GSA).
FEMA	Federal Emergency Management Agency.
FFP	Firm Fixed-Price Contract (also Lump Sum Contract).
FIPS	NBS Federal Information Processing Standard.
FIPS PUBS	FIPS Publications.
FIRMR	Federal Information Resource Management Regulations.
FMS	Foreign Military Sales.
FOC	Final Operating Capability.
FOIA	Freedom of Information Act.
FP	Fixed-Price Contract.
FP-L/H	Fixed-Price – Labor/Hour Contract.
FP-LOE	Fixed-Price – Level-of-Effort Contract.
FPMR	Federal Property Management Regulations.
FPR	Federal Procurement Regulations.
FSC	Federal Supply Classification.
FSG	Federal Supply Group.
FSN	Federal Supply Number.
FSS	Federal Supply Schedule or Federal Supply Service (GSA).

FSTS	Federal Secure Telecommunications System.
FT Fund	A revolving fund, designated as the Federal Telecommunications Fund, used by GSA to pay for GSA-provided common user services, specifically including the current FTS and proposed FTS 2000 services.
FTPS	Federal Telecommunications Standards Program administered by NCS; Standards are published by GSA.
FTS	Federal Telecommunications System.
FTS 2000	Proposed replacement for the Federal Telecommunications System.
FY	Fiscal Year.
FYDP	Five-Year Defense Plan.
GAO	General Accounting Office.
GFE	Government-Furnished Equipment.
GFM	Government-Furnished Material.
GFY	Government Fiscal Year (October to September).
GIDEP	Government-Industry Data Exchange Program.
GOCO	Government Owned – Contractor Operated.
GOGO	Government Owned – Government Operated.
GPO	Government Printing Office.
GPS	Global Positioning System.
GS	General Schedule.
GSA	General Services Administration.
HHS	(Department of) Health and Human Services.
HPA	Head of Procuring Activity.
HSDP	High-Speed Data Processors.
HUD	(Department of) Housing and Urban Development.
ICA	Independent Cost Analysis.
ICAM	Integrated Computer-Aided Manufacturing.
ICE	Independent Cost Estimate.
ICP	Inventory Control Point.
ICST	Institute for Computer Sciences and Technology, National Bureau of Standards, Department of Commerce.
IDAMS	Image Display And Manipulation System.
IDEP	Interservice Data Exchange Program.
IDN	Integrated Data Network.
IFB	Invitation For Bids.
IOC	Initial Operating Capability.
IOI	Internal Operating Instructions.
IQ	Indefinite Quantity Contract.
IR&D	Independent Research & Development.
IRM	Information Resource Manager.
IXS	Information Exchange System.

JOCIT	Jovial Compiler Implementation Tool.
JSIPS	Joint Systems Integration Planning Staff.
JSOP	Joint Strategic Objectives Plan.
JSOR	Joint Service Operational Requirement.
JUMPS	Joint Uniform Military Pay System.
LC	Letter Contract.
LCC	Life Cycle Costing.
LCMP	Life Cycle Management Procedures (DD7920.1).
LCMS	Life Cycle Management System.
L-H	Labor-Hour Contract.
LOI	Letters of Interest.
LRPE	Long-Range Procurement Estimate.
MAISRC	Major Automated Information Systems Review Council (DoD).
MANTECH	MANufacturing TECHnology.
MAPS	Multiple Address Processing System.
MASC	Multiple Award Schedule Contract.
MDA	Multiplexed Data Accumulator.
MENS	Mission Element Need Statement or Mission Essential Need Statement (see DD-5000.1 Major Systems Acquisition).
MILSCAP	Military Standard Contract Administration Procedures.
MIL SPEC	Military Specification.
MIL STD	Military Standard.
MIPR	Military Interdepartmental Purchase Request.
MOD	Modification.
MOL	Maximum Ordering Limit (Federal Supply Service).
MPC	Military Procurement Code.
MYP	Multi-Year Procurement.
NARDIC	Navy Research and Development Information Center.
NASA	National Aeronautics and Space Administration.
NBS	National Bureau of Standards.
NCMA	National Contract Management Association.
NCS	National Communications System; responsible for setting U.S. Government standards administered by GSA; also holds primary responsibility for emergency communications planning.
NICRAD	Navy-Industry Cooperative Research and Development.
NIP	Notice of Intent to Purchase.
NMCS	National Military Command System.
NSA	National Security Agency.

NSEP	National Security and Emergency Preparedness.
NSF	National Science Foundation.
NSIA	National Security Industrial Association.
NTIA	National Telecommunications and Information Administration of the Department of Commerce; replaced the Office of Telecommunications Policy in 1970 as planner and coordinator for government communications programs; primarily responsible for radio.
NTIS	National Technical Information Service.
Obligation	"Earmarking" of specific funding for a contract from committed agency funds.
OCS	Office of Contract Settlement.
OFCC	Office of Federal Contract Compliance.
Off-Site	Services to be provided near but not in government facilities.
OFMP	Office of Federal Management Policy (GSA).
OFPP	Office of Federal Procurement Policy.
OIRM	Office of Information Resources Management.
O&M	Operations & Maintenance.
OMB	Office of Management and Budget.
O,M&R	Operations, Maintenance, and Repair.
On-Site	Services to be performed on a government installation or in a specified building.
OPM	Office of Procurement Management (GSA) or Office of Personnel Management.
Options	Sole-source additions to the base contract for services or goods to be exercised at the government's discretion.
OSHA	Occupational Safety and Health Act.
OSP	Offshore Procurement.
OTA	Office of Technology Assessment (Congress).
Out-Year	Proposed funding for fiscal years beyond the Budget Year (next fiscal year).
P-I	FY Defense Production Budget.
P3I	Pre-Planned Product Improvement (program in DoD).
PAR	Procurement Authorization Request or Procurement Action Report.
PAS	Pre-Award Survey.
PASS	Procurement Automated Source System.
PCO	Procurement Contracting Officer.
PDA	Principal Development Agency.
PDM	Program Decision Memorandum.
PDR	Preliminary Design Review.
PIR	Procurement Information Reporting.
PME	Performance Monitoring Equipment.

PMP	Purchase Management Plan.
PO	Purchase Order or Program Office.
POM	Program Objective Memorandum.
PPBS	Planning, Programming, Budgeting System.
PR	Purchase Request or Procurement Requisition.
PS	Performance Specification – Alternative to a Statement of Work, when work to be performed can be clearly specified.
QA	Quality Assurance.
QAO	Quality Assurance Office.
QMCS	Quality Monitoring and Control System (DoD software).
QMR	Qualitative Material Requirement (Army).
QPL	Qualified Products List.
QRC	Quick Reaction Capability.
QRI	Quick Reaction Inquiry.
R-I	FY Defense RDT&E Budget.
RAM	Reliability, Availability, and Maintainability.
RC	Requirements Contract.
R&D	Research and Development.
RDA	Research, Development, and Acquisition.
RDD	Required Delivery Date.
RD&E	Research, Development, and Engineering.
RDF	Rapid Deployment Force.
RDT&E	Research, Development, Test, and Engineering.
RFI	Request for Information.
RFP	Request For Proposal.
RFQ	Request For Quotation.
RFTP	Request For Technical Proposals (Two-Step).
ROC	Required Operational Capability.
ROI	Return On Investment.
RTAS	Real Time Analysis System.
RTDS	Real Time Display System.
SA	Supplemental Agreement.
SBA	Small Business Administration.
SB Set-Aside	Small Business Set-Aside contract opportunities with bidders limited to certified small businesses.
SCA	Service Contract Act (1964 as amended).
SCN	Specification Change Notice.
SDN	Secure Data Network.
SEC	Securities and Exchange Commission.
SE&I	Systems Engineering and Integration.
SETA	Systems Engineering/Technical Assistance.
SETS	Systems Engineering/Technical Support.
SIBAC	Simplified Intragovernmental Billing and Collection System.

SIMP	Systems Integration Master Plan.
SIOP	Single Integrated Operations Plan.
SNAP	Shipboard Nontactical ADP Program.
Sole Source	Contract award without competition.
Solicitation	Invitation to submit a bid.
SOR	Specific Operational Requirement.
SOW	Statement of Work.
SSA	Source Selection Authority (DoD).
SSAC	Source Selection Advisory Council.
SSEB	Source Selection Evaluation Board.
SSO	Source Selection Official (NASA).
STINFO	Scientific and Technical INFOrmation Program-Air Force/NASA.
STU	Secure Telephone Unit.
SWO	Stop-Work Order.
Synopsis	Brief description of contract opportunity in CBD after D&F and before release of solicitation.
TA/AS	Technical Assistance/Analyst Services.
TEMPEST	Studies, inspections, and tests of unintentional electro- magnetic radiation from computer, communication, command, and control equipment that may cause unauthorized disclosure of information; usually applied to DoD and security agency testing programs.
TILO	Qualified Requirements Information Program – Army.
TM	Time and Materials contract.
TOA	Total Obligational Authority (Defense).
TOD	Technical Objective Document.
TR	Temporary Regulation (added to FPR, FAR).
TRACE	Total Risk Assessing Cost Estimate.
TRCO	Technical Representative of the Contracting Offices.
TREAS	Department of the Treasury.
TRP	Technical Resources Plan.
TSP	GSA's Teleprocessing Services Program.
TVA	Tennessee Valley Authority.
UCAS	Uniform Cost Accounting System.
USA	U.S. Army.
USAF	U.S. Air Force.
USCG	U.S. Coast Guard.
USMC	U.S. Marine Corps.
USN	U.S. Navy.
U.S.C.	United States Code.
USPS	United States Postal Service.
USRRB	United States Railroad Retirement Board.

VA	Veterans Administration.
VE	Value Engineering.
VHSIC	Very High Speed Integrated Circuits.
VIABLE	Vertical Installation Automation BaseLine (Army).
VICI	Voice Input Code Identifier.
WBS	Work Breakdown Structure.
WGM	Weighted Guidelines Method.
WIN	WWMCCS Intercomputer Network.
WIS	WWMCCS Information Systems.
WS	Work Statement – Offerer's description of the work to be done (proposal or contract).
WWMCCS	World-Wide Military Command and Control System.

B

General And Industry Acronyms

ADP	Automatic Data Processing.
ADPE	Automatic Data Processing Equipment.
ANSI	American National Standards Institute.
CAD	Computer-Aided Design.
CAM	Computer-Aided Manufacturing.
CBEMA	Computer and Business Equipment Manufacturers Association.
CCITT	Comite Consultaif Internationale de Telegraphique et Telephonique; Committee of the International Telecommunication Union.
COBOL	COmmon Business-Oriented Language.
CPU	Central Processor Unit.
DBMS	Data Base Management System.
EIA	Electronic Industries Association.
IEEE	Institute of Electrical and Electronics Engineers.
ISO	International Organization for Standardization; voluntary international standards organization and member of CCITT.
ITU	International Telecommunication Union.
LSI	Large-Scale Integration.
PROM	Programmable Read-Only Memory.
UPS	Uninterruptable Power Source.
VLSI	Very Large Scale Integration.

VII

Appendix D: Policies, Regulations, and Standards

A

OMB Circulars

A-11	Preparation and Submission of Budget Estimates.
A-49	Use of Management and Operating Contracts.
A-71	Responsibilities for the Administration and Management of Automatic Data Processing Activities.
A-76	Policies for Acquiring Commercial or Industrial Products and Services Needed by the Government.
A-109	Major Systems Acquisitions.
A-120	Guidelines for the Use of Consulting Services.
A-121	Cost Accounting, Cost Recovery, and Integrated Sharing of Data Processing Facilities.
A-123	Internal Control Systems.
A-127	Financial Management Systems.
A-130	Management of Federal Information Resources.

B

GSA Publications

The FIRMR as published by GSA is the primary regulation for use by federal agencies in the management, acquisition, and use of both ADP and telecommunications information resources.

C

DoD Directives

DD-5000.1	Major System Acquisitions.
DD-5000.2	Major System Acquisition Process.
DD-5000.11	DoD Data Elements and Data Codes Standardization Program.
DD-5000.31	Interim List of DoD-Approved High-Order Languages.
DD-5000.35	Defense Acquisition Regulatory Systems.
DD-5200.1	DoD Information Security Program.
DD-5200.28	Security Requirements for Automatic Data Processing

	(ADP) Systems.
DD-5200.28-M	Manual of Techniques and Procedures for Implementing, Deactivating, Testing, and Evaluating Secure Resource Sharing ADP Systems.
DD-7920.1	Life Cycle Management of Automated Information (AIS).
DD-7920.2	Major Automated Information Systems Approval Process.
DD-7935	Automated Data Systems (ADS) Documentation.

D

Standards

ADCCP	Advanced Data Communications Control Procedures; ANSI standard X3.66 of 1979; also NBS FIPS 71.
CCITT G.711	International PCM standard.
CCITT T.0	International standard for classification of facsimile apparatus for document transmission over telephone-type circuits.
DEA-1	Proposed ISO standard for data encryption based on the NBS DES.
EIA RS-170	Monochrome video standard.
EIA RS-170A	Color video standard.
EIA RS-464	EIA PBX standards.
EIA RS-465	Standard for Group III facsimile.
EIA RS-466	Facsimile standard; procedures for document transmission in the general switched telephone network.
EIA RS-232-C	EIA DCE to DTE interface standard using a 25-pin connector; similar to CCITT V.24.
EIA RS-449	New EIA standard DTE to DCE interface which replaces RS-232C.
FED-STD 1000	Proposed Federal Standard for adoption of the full OSI reference model.
FED-STD 1026	Federal Data Encryption Standard (DES) adopted in 1983; also FIPS 46.
FED-STD 1041	Equivalent to FIPS 100.
FED-STD 1061	Group II facsimile standard (1981).
FED-STD 1062	Federal standard for Group III facsimile; equivalent to EIA RS-465.
FED-STD 1063	Federal facsimile standard equivalent to EIA RS-466.

FED-STDs 1005, 1005A - 1008	Federal standards for DCE coding and modulation.
FIPS 46	NBS Data Encryption Standard (DES).
FIPS 81	DES Modes of Operation.
FIPS 100	NBS standard for packet switched networks; subset of 1980 CCITT X.25.
FIPS 107	NBS standard for local area networks, similar to IEEE 802.2 and 802.3.
IEEE 802.2	OSI-compatible IEEE standard for data-link control in local area networks.
IEEE 802.3	Local area network standard similar to Ethernet.
IEEE 802.4	OSI-compatible standard for token-bus local area networks.
IEEE 802.5	Local area network standard for token-ring networks.
MIL-STD-188-114C	Physical interface protocol similar to RS-232 and RS-449.
MIL-STD-1777	IP - Internet Protocol.
MIL-STD-1778	TCP - Transmission Control Protocol.
MIL-STD-1780	File Transfer Protocol.
MIL-STD-1781	Simple Mail Transfer Protocol (electronic mail).
MIL-STD-1782	TELNET - virtual terminal protocol.
MIL-STD-1815A	Ada Programming Language Standard.
X.12	ANSI standard for Electronic Data Interchange.
X.21	CCITT standard for interface between DTE and DCE for synchronous operation on public data networks.
X.25	CCITT standard for interface between DTE and DCE for terminals operating in the packet mode on public data networks.
X.75	CCITT standard for links that interface different packet networks.
X.400	ISO application-level standard for the electronic transfer of messages (electronic mail).

VII

Appendix E: Related INPUT Reports

A

Annual Market Analyses

Procurement Analysis Report, GFY 1987-1992.

U.S. Information Services Industry Forecasts, 1985-1990.

U.S. Professional Services Market, 1985-1990.

U.S. Turnkey Systems Markets, 1985-1990.

U.S. Processing Services and Turnkey Systems Market, 1984-1989.

U.S. Information Services Vertical Markets, 1986-1991.

U.S. Information Services Cross-Industry Markets, 1986-1991.

B

Industry Surveys

Information Services Industry Report, 1985.

Eighteenth Annual ADAPSO Survey of the Computer Services Industry, 1984.

Directory of Leading U.S. Information Services Vendors, 1983.

C

Market Reports

Federal Government Professional Services Market, GFY, 1986-1991.

Federal Office Information Systems Market, 1986.

Commercial Systems Integration: Opportunities and Challenges, 1986.

Commercial Systems Integration Markets, 1986-1991.

Professional Services Market Directions, 1986.

Medical Processing Services: Turnkey Systems Markets, 1986.

Banking and Financial Services: The Next Decade, 1985-1995 Strategic Analysis, 1986.

Computer Integrated Manufacturing Markets, 1986-1991, 1986.

Turnkey Systems Pricing: Trends and Opportunities, 1985.

New Opportunities for Software Productivity Improvement, 1985.

VII

Appendix F: Systems Integration/ Turnkey Systems Questionnaires

A

Definitions

For the purposes of this survey, we have defined "Systems Integration" and other related services "for ADP" as follows.

Systems Integration—Services associated with systems design and integration, and installation and government acceptance of ADP/Telecommunications systems. Services may be provided with related engineering activities such as Systems Engineering and Integration (SE&I) or System Engineering and Technical Assistance (SETA).

Turnkey Systems—Turnkey systems, also known as integrated systems, include systems and applications software packages with hardware as a single entity. Most CAD/CAM systems and many small business systems are integrated systems. This mode does not include specialized hardware systems such as word processors, cash registers, and process control systems.

Professional Services—Professional services include consulting, education and training, programming and analysis, facilities management, and systems integration.

Supercomputer—High-powered processors with numerical processing throughout that is significantly greater than the fastest general purpose computers, with capacities in the 10-50 million floating point operations per second (MFLOPS) range. Newer supercomputers, with burst modes approaching 300 MFLOPS, main storage size up to 10 million words, and on-line storage in the one-to-three gigabyte class, are labeled Class IV to Class VII in agency long-range plans.

B

Systems Integration/ Turnkey Systems— Agency Questionnaire

1 Does your agency plan to expand, upgrade, or replace any of its current computer systems in the next five years?

____ Yes ____ No

(If Yes):

a. How many will be expanded? ____________________

____

____

b. How many will be upgraded? ____________________

____

____

c. How many will be replaced? ____________________

____

____

d. What major applications will be changed with these systems?

____________________ ____________________

____________________ ____________________

____________________ ____________________

2 Does your agency plan to add new in-house computers in the next five years?

____ Yes ____ No ____ Don't Know

a. What kind of computers/systems will be added?

______________________ ______________________

______________________ ______________________

______________________ ______________________

b. What major applications will be supported by these new computers/systems?

____

____

(If Don't Know):

c. Who could tell us what kind of systems and applications are being considered?

Name: ____________________________________

Title: ____________________________________

Telephone: ________________________________

3 Does your agency currently use outside computing resources or services to satisfy information processing requirements?

____ Yes ____ No

(If Yes):

a. Why does your agency use outside services?

____

____

b. What major applications are supported by outside services?

____________________ ____________________

____________________ ____________________

____________________ ____________________

c. What outside services does your agency use? (Check all that apply)

____ Other Agency Data Centers

____ Remote Computing Service

____ Dedicated COCO (Contractor-Owned, Contractor-Operated)

d. Does your agency plan to convert any of these services or applications to in-house services?

____ Yes ____ No

1. Which services?

____________________ ____________________

____________________ ____________________

2. Which Major applications?

____________________ ____________________

____________________ ____________________

3. Why? ____

____

4 How does your agency plan to accomplish the change and/or addition of computer systems? (Yes or No)

____ Buy integrated system(s)

____ Buy turnkey system(s)

____ Buy hardware separately and use an integrated contractor

____ Buy hardware separately and do integration in-house

____ Move the applications to outside sources such as:

    ____ Other Agency Data Centers

    ____ Remote Computing Service (for instance, Teleprocessing Services Program)

    ____ Contractor-Owned Contractor-Operated Facilities

5 How would you rank the following systems integration vendor (contractor) characteristics with respect to performance for your agency? (1 = Definitely Not Important, 2 = Somewhat Important, 3 = Important, 4 = Very Important, 5 = Crucial)

	Characteristic	Rank
1.	Application Experience	1 2 3 4 5
2.	Integration Experience	1 2 3 4 5
3.	Staff Experience	1 2 3 4 5
4.	Hardware Offered	1 2 3 4 5
5.	Software Offered	1 2 3 4 5
6.	Support	1 2 3 4 5
7.	Federal Contract	1 2 3 4 5
8.	Agency Experience	1 2 3 4 5
9.	Price	1 2 3 4 5

10. Location 1 2 3 4 5

11. Other ______________________________ 1 2 3 4 5

6 What level of satisfaction, on a scale of 1 to 5, have you or your agency experienced with system integration vendors in the past regarding:

a. Quality of Work	1 2 3 4 5
b. Quantity of Work	1 2 3 4 5
c. Responsiveness of Agency Needs	1 2 3 4 5
d. Project Management	1 2 3 4 5
e. Development Visibility	1 2 3 4 5
f. Delivery Schedule(s)	1 2 3 4 5
g. Cost	1 2 3 4 5

7 What would you like to see vendors do in the next 2-5 years to make their services more valuable?

____

____

____

8 Which type of vendor or organization appears more desirable to performing systems integration?

____ Hardware Manufacturers

____ Professional Services

____ Engineering and Construction

____ Communications Vendors

____ Aerospace (Divisions)

____ Not-For-Profit

9 What type of contract does your agency prefer for systems integration?

____ Cost Plus ____ Fixed Price ____ Mix

____Other (Specify)

10 Will your agency be adding any new (secondary) applications to new or recently installed systems integration or turnkey systems projects?

____

____

____

11 What impact, if any, has Grumm-Rudman and other budget constraints had on systems integration/turnkey systems acquisitions?

____

____

____

12 Have standards activities (from NBS, the oversights, or such organizations as the ISO) had any impact on your acquisition of system integration or turnkey systems? If so, how have they affected your plans?

____

____

____

13 To what extent, if any, will your system integration plans involve supercomputers?

____

____

____

14 How does your agency view the OMB A-109 Major System Acquisition Guidelines (DD5000.1/ 5000.2 for DoD)?

____ Useful ____ Effective____ No Opinion

____ Unnecessarily Lengthy ____ Unnecessarily Expensive

____ Other (What?) ________________________________

15 What would be the controlling criteria in selection of a systems integration contractor?

____ Proposed Technical Solution

____ Risk Containment Procedures

____ Contract Type

____ Initial Cost

____ Life Cycle Cost

____ Other ____________________________________

____ Don't Know

16 Could you identify those factors (non-technical) that would have the greatest impact on your agency's computer systems plans?

____

____

____

17 What technological changes might alter the way your agency accomplishes information processing?

____

____

____

C

Systems Integration/ Turnkey Systems— Vendor Questionnaire

Does your company now provide or plan to provide systems integration services or turnkey systems to the federal government?

____ Yes ____ No

(If No, close interview.)

1 What types of systems or services do you provide or plan to provide?

	Current		Future	
Turnkey Systems	**Yes**	**No**	**Yes**	**No**
CAD/CAM	____	____	____	____
CIM	____	____	____	____
Training and Simulation	____	____	____	____
Finance and Budget	____	____	____	____
Maintenance and Job Tracking	____	____	____	____
Energy Management	____	____	____	____
Graphics and Mapping	____	____	____	____
Cargo and Transportation	____	____	____	____
Other	____	____	____	____

Systems Integration

Hardware Systems ____ ____ ____ ____

Off-the-Shelf Applications Software ____ ____ ____ ____

Professional Services

System Design ____ ____ ____ ____

System Engineering ____ ____ ____ ____

Site Preparation and Installation ____ ____ ____ ____

Applications Software ____ ____ ____ ____

Applications Code Conversion ____ ____ ____ ____

Independent Validation and Verification ____ ____ ____ ____

Data Telecommunications Services

Communication Controllers ____ ____ ____ ____

VANs and LANs ____ ____ ____ ____

Dedicated Media Systems ____ ____ ____ ____

2 What has been your company's agency experience and current contracts awarded for Systems Integration or Turnkey Systems?

Agency	**Previous**	**Description**	**Award Date**	**Length Options**	**Dollar Value**
Army					
Navy					
Air Force					
Defense					
NASA					
HUD					
HHS					

Commerce					
Energy					
Education					
Interior					
DOT					
State					
Justice					
Treasury					
Labor					

3 In your opinion, which agencies provide the most attractive opportunities for your company?

4 Which of your company's services or product capabilities do you think agencies find most attractive?

5a What differences do you see between commercial markets and the federal market for your products and services?

5b Why do these differences exist? (Prompts: Technical, Regulatory, Funding, Nature of Clients, etc.)

____

____

____

6 What should be controlling criteria in selection of a (turnkey system, systems integration) vendor?

TS	**IS**	
______	______	Proposed Technical Solution
______	______	Contract Type
______	______	Risk Containment Procedures
______	______	Initial Cost
______	______	Life Cycle Cost
______	______	Other (Specify) __________________
______	______	Don't Know

7 Do you anticipate using supercomputers in systems integration or turnkey systems offerings over the next five years? How will you apply them?

____

____

____

8 What are the principal business activities/revenue sources for your company?

Fiscal Year End (Month): ____________

	Revenue ($ Millions)		
	1984	**1985**	**1986**
Total Company	_______	_______	_______
Information Systems and Service	_______	_______	_______
Non-Captive Information	_______	_______	_______
Systems and Services	_______	_______	_______
Non-Federal Systems Integration	_______	_______	_______
Federal Information Systems and Services	_______	_______	_______
Federal Systems Integration	_______	_______	_______
Federal Turnkey Systems	_______	_______	_______

9 What percentage of FY86 Federal revenue was for the following systems integration and turnkey systems services?

_________	Systems Integration/Turnkey Systems
_________	Hardware
_________	Software
_________	Professional Services
_________	Network Services

10 What "new" technologies do you think will affect major federal information systems and services procurements in the next five years?

____

____

____

11 What do you believe vendors need to do over the next five years to make their products and services more valuable to the federal government?

____

____

____

VIII

About INPUT

Company Profile

Founded in 1974, INPUT has become a leading international planning services firm. Clients include over 200 of the world's largest and most technically advanced companies.

Through market research, technology forecasting, and market/competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, office systems, and information services. Clients receive reports, presentations, access to data on which analyses are based, and continuous client support.

INPUT is a service company. Through advisory/research planning services, multiclient studies, and proprietary consulting, INPUT serves clients' ongoing planning information needs.

Staff Credentials

INPUT's professional staff have backgrounds in marketing, planning, information processing, and market research in some of the world's leading organizations. Many of INPUT's professional staff have held executive positions in the following business sectors:

- Computer systems
- Software
- Turnkey systems
- Field service (customer service)
- Processing services
- Professional services
- Data processing
- Network services
- Communications

Educational backgrounds include both technical and business specializations, and many INPUT staff hold advanced degrees.

Domestic and European Planning Services

INPUT offers eight basic information services: six covering U.S. information industry markets and two covering European information industry markets.

1. Market Analysis Service (MAS)

Provides up-to-date U.S. information services market analyses, five-year forecasts, trend analyses and sound recommendations for action. MAPS is designed to satisfy the planning and marketing requirements of current and potential information services vendors.

2. Company Analysis Service (CAS)

Is a comprehensive reference service covering more than 4,000 U.S. information services vendor organizations. CAS is often used for competitive analysis and pre-screening of acquisition and joint venture candidates.

3. Electronic Data Interchange Planning Service (EDIPS)

Focusing on what is fast becoming a major computer/communications market opportunity, INPUT's EDIPS keeps you informed. Through monthly newsletters, timely news flashes, comprehensive studies, joint user/vendor conference, and telephone inquiry privileges you will be informed and stay informed about the events and issues impacting this burgeoning market.

4. Federal Information Systems and Services Program (FISSP)

Presents highly specific information on U.S. federal government procurement practices, identifies information services vendor opportunities, and provides guidance from INPUT's experienced Washington professionals to help clients maximize sales effectiveness in the government marketplace.

5. Information Systems Program (ISP)

Is designed for executives of small, medium, and large information systems organizations and provides crucial information for planning, procurement, and management decision making. The program examines new service offerings, technological advances, user requirements for systems and services, IS spending patterns, and more. ISP is widely used by both user and vendor organizations.

6. Customer Service Program U.S. (CSP)

Provides customer service organization management with data and analyses needed for marketing, technical, financial, and organizational planning.

The program pinpoints user perceptions of service received, presents vendor-by-vendor service comparisons and analyzes and forecasts service markets for large systems, small systems, telecommunications systems, software maintenance, and third-party maintenance.

7. Western European Customer Service Program (CSPE)

Parallels the U.S. Customer Service Program, dealing with comparable issues in European markets.

8. Western European Information Services Program (ISPE)

Analyzes and forecasts European information services markets. Clients receive timely planning information through research-based studies, conferences, client meetings, and continuous client support.

Customized Planning Services Available

In addition to standard continuous information programs, INPUT will work with you to develop and provide a customized planning service which meets your unique requirements.

An Effective Combination

INPUT'S Executive Planning Services are built upon an effective combination of research-based studies, client meetings, informative conferences, and continuous client support. Each service is designed to deliver the information you need in the form most useful to you, the client. Executive Planning Services are composed of *varied combinations of the following* products and services:

Research-Based Studies
Following a proven research methodology, INPUT conducts major research studies throughout each program year. 1987 projects include:

- √ Commercial Systems Integration Implementations
- √ On-Line Data Base Markets, 1987-1992
- √ Network Integration
- √ Future DBMS Markets
- √ Economics of Distributed Data Processing
- √ Guide to EDI Implementation
- √ Chargeback Systems for IS Organizations
- √ Office Productivity
- √ Distributed Data Base Management
- √ DEC vs. IBM 1987-1992
- √ Third-Party Maintenance User Requirements & Market Analysis
- √ Large- and Small-Systems Service Market Analysis
- √ Customer Service Pricing
- √ Automated Field Service Delivery

√ Software Maintenance Markets
√ Third-Party Maintenance Competitive Analysis
...and more!

Information Service Industry Reports

INPUT's Executive Planning Services address specific issues, competitive environment and user expenditures relative to:

- Software
- Processing/Network Services
- Systems Integration
- Telecommunications Service
- Office Systems
- Professional Services
- Turnkey Systems
- Small-Systems Service
- Third-Party Maintenance
- Large-Systems Service

Industry Market Reports

Detailed analysis of market trends, forces driving the markets, problems, opportunities and user expenditures are available for the following segments:

- Banking/Finance
- Discrete Manufacturing
- Distribution
- Education
- Federal/State and Local Government
- Insurance
- Medical
- Process Manufacturing
- Service Industry
- Telecommunications
- Utilities
- Accounting
- Education/Training
- Engineering/Scientific
- Human Resources
- Planning and Analysis
- Systems Software
- Utility Processing
- Value-Added Networks
- Other Cross-Industry Markets
- Transportation

Hotline: Client Inquiry Services

Daily, weekly, monthly, quarterly, and annual client planning questions are answered quickly and completely through use of INPUT's Client Hotline. Clients may call any INPUT office (California, New Jersey, Washington D.C., or London) during business hours or they may call a unique voicemail service to place questions after hours. This effective Hotline service is the cornerstone of every INPUT Executive Planning Service.

The Information Center

One of the largest and most complete collections of information services industry data, the Information Center houses literally thousands of up-to-date files on vendors, industry markets, applications, current/emerging technologies, and more. Clients have complete access to the Information Center. In addition to the information contained in its files, the center

maintains an 18-month inventory of over 130 major trade publications, vendor consultant manuals, economic data, government publications, and a variety of important industry documents.

Access to INPUT Professional Staff
Direct access to our staff, many of whom have more than 20 years of experience in the information industry, provides you continuous research and planning support. When you buy INPUT, you buy experience and knowledge.

Annual Client Conference
Each year, you can attend INPUT's Annual Client Conference. This three-day event addresses the status and future of the information services industry, the competitive environment, important industry trends potentially affecting your business, the impact of new technology and new service offerings, and more.

You will attend with top executives from many of the industry's leading, fastest-growing, and most successful vendor companies, and with top Information Systems (IS) managers from some of the world's most sophisticated user organizations.

On-Site Presentation by INPUT Executive
Many of INPUT's Planning Services offer an informative presentation at your site. Covering the year's research, this session is held in the fourth quarter of each calendar year.

Proprietary Research Service

INPUT conducts proprietary research that meets the unique requirements of an individual client. INPUT's custom research is effectively used:

For Business Planning
Planning for new products, planning for business startups, planning expansion of an existing business or product line—each plan requires reliable information and analysis to support major decisions. INPUT's dedicated efforts and custom research expertise in business planning ensure comprehensive identification and analysis of the many factors affecting the final decision.

For Acquisition Planning
Successful acquisition and divestiture of information services companies requires reliable information. Through constant contact with information services vendor organizations, continuous tracking of company size, growth, financials, and management "chemistry," INPUT can provide the valuable insight and analysis you need to select the most suitable candidates.

For The Total Acquisition Process

INPUT has the credentials, the database of company information and, most importantly, the contacts to assist you with the total acquisition and/or partnering relationship processes:

- √ Due Diligence
- √ Schedules and Introduction
- √ Establish Set of Criteria & Definitions
- √ Retainer and Fee-Based
- √ Active Search

For Competitive Analysis

Knowing marketing and sales tactics, product capabilities, strategic objectives, competitive posture, and strengths and weaknesses of your competition is as critical as knowing your own. The career experience of its professionals, coupled with its collection and maintenance of current financial, strategic, tactical and operational information about more than 4,000 active companies, uniquely qualifies INPUT to provide the best competitive information available today.

For Market and Product Analysis

Developing new products and entering new markets involves considerable investment and risk. INPUT regularly conducts research for clients to identify product requirements, market dynamics, and market growth.

More About INPUT...

- More than 5,000 organizations, worldwide, have charted business direction based on INPUT's research and analysis.

- Many clients invest more than $50,000 each year to receive INPUT's recommendations and planning information.

- INPUT conducts proprietary research, regularly, for some of the largest companies in the world.

- INPUT has developed and maintains one of the most complete information industry libraries in the world (access is granted to all INPUT clients).

- INPUT clients control an estimated 70% of the total information industry market.

- INPUT analyses and forecasts are founded upon years of practical experience, knowledge of historical industry performance, continual tracking of day-to-day industry events, knowledge of user and vendor plans, and business savvy.

- INPUT analysts accurately predicted the growth of the information services market—at a time when most research organizations deemed it a transient market. INPUT predicted the growth of the microcomputer market in 1980 and accurately forecasted its slowdown in 1984.

For More Information . . .
INPUT offers products and services that can improve productivity, and ultimately profit in your firm. Please give us a call today. Our representatives will be happy to send you further information on our services or to arrange a formal presentation at your offices.

For details on delivery schedules, client service entitlement, or Hotline support simply call your nearest INPUT office; our customer support group will be available to answer your questions.

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